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SUMMARY OF RECENT ABSTRACTS *

VII. HELMINTHIASIS

General

Bergstermann *et al.* (p. 568) have published a book on the parasitic worms of man in Europe.

Studies on the incidence of various helminth and other infections in Korea, Okinawa, the Ryukyu Islands, and Japan, are reported in the Japan Logistical Command Bulletin (pp. 1050, 1051).

A note on the intestinal worms found in man in Chile is contributed by Neghme and Silva (p. 144).

A modification of the Willis flotation technique is described by Nájera (p. 524), who claims that it is a great improvement.

Bates and Alberto (p. 1132) show that the concentration method for faeces with acid and sodium sulphate followed by ether is much more effective than direct examination for detection of worm eggs.

Kerr and Cavett (p. 886) describe a technique for initial evaluation of potential anthelmintics, for details of which the original should be consulted.

Trematodes

Schistosomiasis

General: S. haematobium

Fairley (p. 634), from his long experience, discusses recent work on schistosomiasis, and the problems which remain, in a paper which should be read in full.

Gaud and Jaubertie (p. 776) refer to the importance of human migration (for instance, of labourers) in the spread of schistosomiasis in Africa, and to the fact that the introduction of new methods to improve the diet of Africans, notably in rice cultivation and fisheries, tends to increase the incidence.

The distribution of urinary schistosomiasis in Morocco is described by Crozes (p. 59); high infection rates are found along some of the water-courses, but in general the incidence varies from year to year.

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1952, v. 49. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

In a group of villages in Sierra Leone, GERBER (p. 875) found *S. haematobium* in 65 per cent. of the people, and a heavy incidence in snails, of which the most common appeared to be *Bulinus africanus*. [Earlier workers had found *B. globosus* more frequently, and Gordon comments that the identifications had been made by different conchologists.] Gerber discusses immunity, which, he thinks, is best stimulated by moderate initial infection followed by regular reinfections such as may occur by occasional exposure during one transmission season, followed by a pause until the next season. In many places, however, infection is too frequent for optimum development of immunity.

In Northern and Eastern Transvaal, infection rates with *S. haematobium* of up to 80 per cent. are found in African schoolchildren, but much lower rates in European schoolchildren. The main snail host is *Physopsis africana*. The studies of ANNECKE and PEACOCK (p. 60) on control of snails with copper sulphate indicate that one or two applications of 5 to 10 p.p.m. to river water, repeated if necessary two or three times a year, might be satisfactory. The work was done experimentally, and no large-scale control work was undertaken.

DESCHIENS (p. 776) discusses the distribution of *S. haematobium* and *S. mansoni* in French overseas territories, and (p. 777) lists the snail hosts.

From a study of *Bulinus truncatus* in Iraq, WATSON (pp. 413, 1053) concludes that the principal factor influencing the snail population and reproductive activity is the temperature of water. Snails emerge from hibernation when this reaches 25°C. (in May or June) and they go into hibernation when the temperature falls to about 15°–18°C. (towards the end of November). There is therefore a danger period from May or June to October or November.

A condition of bladder paralysis lasting for several days, but recovering completely, is reported from Southern Rhodesia by GELFAND and BARNETT (p. 1074). All the patients had diffuse schistosomal lesions of the bladder, which may have been concerned in the aetiology of the condition.

Lesions of the female pelvic organs, due to *S. haematobium*, are reported from Dakar by CAMAIN *et al.* (p. 61), and aneurysm of the pulmonary artery by ZAKY (p. 1053).

From a trial of various treatment schedules with sodium antimony tartrate in urinary schistosomiasis, GIRGIS and MAGID (p. 635) conclude that the optimum is a total of 12 to 15 mgm. per kgm., divided into 6 injections given on 6 consecutive days. With the intensive sodium antimony tartrate treatment of *S. haematobium* infections BARTON (p. 878) in Kenya obtained apparent cure in 62 per cent. of patients, with toxic side-effects in only 10 per cent. and death in 0·6 per cent. (probably due to failure to carry out instructions). The general impression was encouraging.

In a few patients with *S. haematobium* infection treated intensively with Repodral [Fouadin] AZAR *et al.* (p. 413) noted effects on the heart shown by electrocardiographic changes; these were reversible, but nevertheless the authors recommend that the intensive treatment should not be used in patients with cardiovascular disease.

DESCHIENS (p. 281) writes on the treatment of schistosomiasis, especially with miracil, and also on the treatment of *S. haematobium* infections with tin salts given by mouth. Transient side-effects from high doses of miracil, especially in raising blood pressure, are reported by NOR EL DIN and DAWOOD (p. 63), and SOUIDAN (p. 63) notes that, in dogs, miracil injected intravenously shows an inhibitory action on the heart, for which atropine is an antidote. With Nilodin, MESSENT (p. 62) records apparent cure in 64 per cent. of Africans infected with *S. haematobium*, after courses comprising

gross dosages up to 75 mgm. per kgm. body weight, given in divided doses during 3 days, but in the Gold Coast HARRIS (p. 878) found that a total dosage of 75 mgm. per kgm. produced apparent cure in only 43 per cent. of boys treated, and that higher doses were not tolerated. WATSON *et al.* (p. 1133), however, found Nilodin D effective in a total dosage of 100 mgm. per kgm. (given as 10 mgm. per kgm. twice daily for 5 days). In doses of 15 mgm. per kgm. daily, in a course intended to last for 5 days, Nilodin was not successful in 7 Sudanese patients treated by HASEEB (p. 971). Several patients showed signs of toxicity.

Previous work has indicated that animals deficient in vitamin A show diminished resistance to helminth infections, but WATSON (p. 971), in a test on labourers in Baghdad, one group of whom were given vitamin A while working in infected water, found no evidence of protection. He discusses the possible reasons for this, which may be related to a difference between rats and man in the mechanism of destruction of the worms; this destruction may take place in the liver. The worms in man are in vessels away from the liver, and if they can be driven to the liver by drugs not themselves schistosomicidal, the liver may be able to deal with them provided that vitamin A is plentiful. Specific treatment may therefore be more effective if vitamin A is given also.

DAWOOD (p. 970) found *Bulinus* in the Nile in Southern Egypt, where infection with *S. haematobium* is widespread. He makes the point that control should consist of provision of artesian wells and convenient latrines rather than the use of copper sulphate. He mentions patients with *S. haematobium* diagnosed by the rectal scrape method when eggs could not be found in the urine.

VERCAMMEN-GRANDJEAN (p. 781) and LAGRANGE and FAIN (p. 781) discuss the possibility that a certain frog and some crabs which feed on snails and other aquatic animals may be useful in snail control in the Belgian Congo. DE BONT and DE BONT HERS (p. 1135) similarly write of certain African fish which feed on snails and may be useful in control.

S. mansoni

Both *S. haematobium* and *S. mansoni* occur in the Yemen, and KUNTZ (p. 1052) states that the majority of cases of *S. mansoni* infection are probably contracted in the ablution basins of mosques, which are large pools in which devout Moslems bathe, and in which faeces may be found. WITENBERG (p. 522) points out that over 20 per cent. of immigrants to Israel from Yemen are infected with *S. mansoni*; the incidence of *S. haematobium* is much less.

In a survey of the Eastern Transvaal, PITCHFORD (p. 1053) found *S. mansoni* in 36·1 per cent. of children, a single examination of faeces being carried out. Enlargement of the liver could be correlated with the density of *S. mansoni*. Most infections were found in the Kaap Crocodile river valley, which is highly canalized and contains many dams. *S. haematobium* is widely prevalent in the area.

A focus of *S. mansoni* infection in Pará, Brazil, is reported by MACHADO and MARTINS (p. 63). Examination of faeces of several thousand people in the State of Bahia showed that about half of them were infected with *S. mansoni* (COUTINHO, p. 634).

VERCAMMEN-GRANDJEAN (p. 777) comments on the hairs found on cercariae of *S. mansoni* and first described by GORDON, DAVEY and PEASTON in 1934. He thinks that their arrangement may be such as to allow them to be used in classification of the various species.

The accepted opinion has been that only man and monkeys can pass eggs of *S. mansoni* in faeces, but MOORE and MELENEY (pp. 877, 1057) have now shown that mice, golden hamsters and rice rats can do so, and, further, that rice rats enter water in search of food, and can act as definitive hosts in nature. They suggest that other rodents or even other mammals may possibly act as hosts. KUNTZ (p. 1134) reports for the first time the presence of *S. mansoni* in a rodent (*Gerbillus pyramidum pyramidum*) in nature near Cairo. Many other rodents were examined without success. It is thought that the infected gerbil may have eaten infected snails.

STIREWALT *et al.* (p. 64) discuss the relative advantages of mice, hamsters and cotton rats, and some other animals, for studies on *S. mansoni*. Hamsters show the highest number of maturing schistosomes, but their death rate is high; cotton rats are suitable for study of adult worms, mice for chemotherapy, and rats for immunity studies. LAGRANGE and SCHEECQMANS (p. 524) describe the course of *S. mansoni* infection in cotton rats, which, although not so suitable as mice for chemotherapeutic studies, are useful for the study of certain aspects of development of the parasites. In 24 guineapigs, each infected by cercariae of *S. mansoni* from a single snail, all the infections proved to be unisexual—13 had males only and 11 females only (PARAENSE, p. 779). EVANS and STIREWALT (p. 779) observe that the worm load in experimental *S. mansoni* infection is influenced by several factors, of which the most important are density of exposure of the host, resistance of the host, and infectivity of the cercariae. They show that significant variations in infectivity do occur, and that they appear to be directly related to the physiological condition of the snail host from which the cercariae escape.

Discussing the fact that incompatibilities exist between snail hosts and *S. mansoni* from different places, FILES (p. 780) suggests that these may be due to inter- and intra-specific differences between snail hosts, and physiological differences between strains of the parasites.

FAIN (p. 415) in the Belgian Congo found natural infection with *S. mansoni* in *Biomphalaria alexandrina stanleyi* and *B. a. pfeifferi*; the latter occurs in rivers and is probably a more important host than the former, which is found in Lake Albert. SCHWETZ (p. 780), however, disputes this view, maintaining that the important snail host of *S. mansoni* round Lake Albert is the lake-living *Biomphalaria alexandrina stanleyi*, not, as FAIN believes, *B. a. pfeifferi* which is riverine.

MCQUAY (p. 701) shows that *Tropicorbis havanensis* from Louisiana were not easily infected with a Porto Rican strain of *S. mansoni*, and were resistant to a strain from a baboon. *Australorbis glabratus* could easily be infected with both strains.

A study of the anatomy of planorbid snails from part of Brazil is reported by PENIDO *et al.* (p. 701), and PESSÔA and COUTINHO (p. 876) discuss the snail hosts of *S. mansoni* in Brazil—the large-shelled *Australorbis* (*glabratus* and *olivaceus*) and the small-shelled *Tropicorbis* (*centimetralis*).

STANDEN (p. 414) has studied the effects of temperature, light and salinity of water on the hatching of eggs of *S. mansoni*. The optimum conditions are temperature of 28°C., bright light and plain water. These facts may be useful in developing a test for eggs in faeces. He (p. 1054) shows that there is a greater chance of infecting *Australorbis glabratus* with miracidia of *S. mansoni* in the laboratory if the miracidia are closely confined near the snails, in small containers, than if they are in large containers. A minimum temperature of 26°C. is necessary for adequate development of sporocysts, and the optimum is 26°–28°C.

DUKE (p. 1134) has studied the mode of escape of cercariae of *S. mansoni* from snails; he notes also that cercariae can be found in eggs laid by infected snails.

GORDON and GRIFFITHS (p. 1055) have observed the penetration of the skin by cercariae of *S. mansoni*, which is probably partly mechanical and partly by secretion from the anterior cephalic glands (which were studied in detail). The cercariae (now without tails) undergo a resting phase in the skin tunnel they have made, and this may explain the belief that application of alcohol to the skin, or even brisk rubbing with a towel, shortly after exposure, may lessen the risk of infection.

A useful technique for infecting mice with cercariae of *S. mansoni* is described by OLIVIER and STIREWALT (p. 1056).

Examination of the livers of mice infected with *S. haematobium*, *S. mansoni* and *S. japonicum* has shown that pathological lesions may be produced by infection with worms all of one sex, and therefore in the absence of eggs. In unisexual infections, however, fibrosis is not found. MELENEY *et al.* (p. 880) discuss their findings in this work, and think that the lesions may be due to toxic products of the worms.

MEIRA (p. 737) has published a long monograph on the liver and spleen in *S. mansoni* infection. Although examination of faeces gives higher results than examination of liver specimens taken by the viscerotomy service of Brazil, PARÁ (p. 972) states that the latter is valuable. Liver lesions are very few in the first years of life but increase to a maximum in juveniles and young adults.

It is known that when larvae of various worms are immersed in immune serum a precipitate is formed round them. STANDEN (p. 778) now shows that the majority of normal human and animal sera will kill cercariae of *S. mansoni*, but that the human sera do not produce the precipitate, whereas the normal sera of some animals produce a precipitate similar to that formed by immune human sera. The sera of heavily parasitized rabbits, and of human patients infected with *S. haematobium* or *S. mansoni*, caused the formation of a peri-cercarial membrane which restrained but did not kill the cercariae; this reaction may eventually prove valuable in diagnosis.

In a small outbreak of *S. mansoni* infection in Eritrea, FOSTER *et al.* (p. 414) noted the triad diarrhoea, bronchitis and fever, which they regard as pathognomonic, after an incubation period of about 4 weeks.

DE SILVEIRA (p. 702) examined microscopically the hearts of patients who had been infected with *S. mansoni*; there were only a few with lesions. MARQUES (p. 973) discusses the diagnosis of pulmonary involvement in *S. mansoni* infection. Sputum examination for eggs needs homogenization of the sputum, but eggs are rarely found. Involvement of the spinal cord in *S. mansoni* infection is recorded by ROSS *et al.* (p. 973).

JANSSEN (p. 281) has used thioxanthone (Nilodin) for *S. mansoni* infection, with an apparent failure rate of 10 per cent. on examination of patients 2 months later. Side effects were observed, and sometimes necessitated reduction of dosage or cessation of treatment, but they were usually not serious.

In a rural area of Porto Rico the incidence of *S. mansoni* infection was reduced from 44·6 per cent. to 4·5 by treatment, education, installation of efficient latrines, improvement in water supply, and attempts at biological control of snails. BIAGGI (p. 1057) points out, however, that this detailed control could not be applied to the whole island because it was so expensive.

In experiments with various substances PINTO *et al.* (p. 702), in Brazil found that only the sodium salt of pentachlorophenol at 10 p.p.m. and

copper sulphate at over 30 p.p.m. would kill all the planorbid snails. After tests of certain molluscicides, SZUMLEWICZ and KEMP (p. 1057) report that two, namely, the sodium salt of pentachlorophenol and phenyl-mercury-acetate, are better than copper sulphate against a species of *Australorbis*. Investigations on various molluscicides against *A. glabratus* are reported by WASICKY and UNTI (p. 1135).

S. intercalatum, etc.

SCHWETZ (pp. 782, 783) discusses various schistosomes of the Belgian Congo, accepting *S. intercalatum* as a valid species, though the suggestion is made that it may be *S. mattheei* adapted to man. The host is *Physopsis africana*. He also discusses *S. rodhaini*. SCHWETZ *et al.* (p. 784) found that, by placing snails (previously kept at 26°C.) into water at 18–19°C., the output of cercariae (of *S. rodhaini*) was increased.

S. japonicum

Several field units work in the Philippines, and PESIGAN (p. 975) reports that they recently found *S. japonicum* in 12·2 per cent. of people examined; the disease was present in 61 towns investigated, and absent in 70. Control of *Oncomelania quadrasi* is attempted by molluscicides and by the flame gun, but repeated applications are needed. In part of Fukien Province TANG *et al.* (p. 702) found incidence of infection varying from 16·8 to 47·55 per cent., with the highest rates at ages 11–15. Various rats served as reservoir hosts. *S. japonicum* was found in over 90 per cent. of children in several villages in Japan surveyed by HUNTER *et al.* (p. 633), but in other population centres the infection rate for all ages was lower, even down to less than 5 per cent.

A study of food habits of *O. nosophora*, and its soil preferences, has been made by IZUMI (p. 1058).

MCMULLEN *et al.* (p. 784) have made a study of the habits and ecology of *O. nosophora* in Japan, with a view to controlling it by molluscicides. They conclude that molluscicides are best applied as dust or spray, in April or May after the snails come out from hibernation, or in October when ditches are not in use and before hibernation. Such measures probably need to be repeated for several years. It seems that most infections of *O. nosophora* with *S. japonicum* are acquired in late spring or early summer, and snails of all ages are equally susceptible. MCMULLEN *et al.* (p. 785) show that infection can persist in snails throughout hibernation, to be a factor in human infection during the early cultivation of rice.

In Formosa HSÜ *et al.* (p. 878) studied the snail host of *O. formosana* in small irrigation ditches in the rice-field area. It thrives in water turbid with fine silt. Infection rates from 0·3 to 30 per cent. were found, with a mean of 2·4, but in comment Gordon observes that the method of examination by finding sporocysts would not exclude snails infected by cercariae other than *S. japonicum*.

Pomatiopsis lapidaria is a potential host of *S. japonicum*, and is found near Washington, D.C. (DEWITT, p. 1135).

Discussing *S. japonicum* infections, RECIO (p. 65) distinguishes between schistosomal appendicitis in which ova block the vessels and produce gangrene, and appendiceal schistosomiasis in which ova are present but have not produced any characteristic symptom or sign to distinguish the condition from ordinary recurrent appendicitis. He discusses the relationship between schistosomiasis and cancer of the colon and rectum.

Experiments with mice, and some observations on men working in rice-fields, indicate that 20 per cent. copper oleate ointment applied to the skin

affords considerable protection against infection with *S. japonicum* (HUNTER *et al.*, pp. 785, 879). Phthalates and benzyl benzoate were less effective.

McMULLEN *et al.* (pp. 415, 416) tested 59 chemicals against *O. nosophora*, and found 6 which gave encouraging results. Three were tried under field conditions on more than 18 miles of ditches; they caused very great reduction in the number of snails. Two of them (dinitro-ortho-cyclohexylphenol and its dicylohexylamine salt) are referred to by PESIGAN and MASILUÑGAN (p. 282) who have experimented with them in the control of *O. quadrasi* in moist soil and in water. The chemicals are toxic to fish at 1 p.p.m., but not to plants (for instance, rice). They are not very soluble, which is a disadvantage in treatment of water, but not of soil, and they are not effective in running water. Good results were obtained in field experiments only after preliminary clearance of vegetation from the swamps or banks of streams. BATTE and SWANSON (p. 526) have tested these and other substances against lymnaeid snails and fluke ova. For use in Egypt, KUNTZ and WELLS (p. 973) find dinitro-ortho-cyclohexylphenol and its dicyclohexylamine salt promising. They are lethal to the relevant snails in low concentration and have not shown ill effects on domestic animals in the required concentrations. Testing in the field is still needed, however. The factor of relatively high temperature for optimum action is to be taken into consideration.

Experiments with three halogenated phenols used as molluscicides indicate that at a dose of 7·6 mgm. per kgm. daily in drinking water they are not toxic for cattle (HERDT *et al.*, p. 159). The acute toxicity of such compounds was studied by STOHLMAN (p. 159) on an experimental basis in doses sufficient to cause symptoms.

Experimental work in Egypt indicates that the molluscicidal action of copper sulphate for *Biomphalaria boissyi* is increased with increasing temperatures of the water up to 26°C.; the LD50 at 14°C. is 13 p.p.m. and at 26°C. 0·25 p.p.m. (HOFFMAN and ZAKHARY, p. 525).

Schistosome dermatitis

NEUHAUS (p. 785) has studied the life history of *Trichobilharzia szidati*, a parasite of ducks which causes severe schistosome dermatitis in people breeding carp in Germany. This dermatitis is found in those who bathe in a river in Quebec, and may be due to cercariae of a species of *Trichobilharzia* which were proved experimentally by MILLER and MUNROE (p. 525) to be able to cause the condition in man. The condition occurs in workers in rice fields in Japan; HUNTER *et al.* (p. 416) show that the cause is the cercaria of *Gigantobilharzia sturniae*, a bird schistosome.

Swimmers' itch, probably due to a cercaria from a marine snail, is common in sea-bathers in Hawaii; CHU (p. 1058) has identified the cercaria probably responsible for this.

Other trematodes

Several cases of *Fasciola hepatica* infection in Germany are described by MOHR *et al.* (p. 159). In one fatal case eggs were found only once in the faeces, and it seems that the number of eggs found bears no relation to the severity of the disease—there were multiple abscesses in the liver. Other cases were chronic and tended to recover; emetine was used for the treatment of some patients. Diagnosis is difficult. Phenothiazine is lethal to *F. hepatica* in a dilution of 1 in 8,000 *in vitro* (MACKIE and RAEBURN, p. 882). These authors investigated several other compounds. MANSOUR (p. 283) has studied the action of antimonial compounds on *F. hepatica in vitro*.

The Japan Logistical Command Bulletins (pp. 1050, 1051) show that the incidence of *Clonorchis sinensis* found in Southern Korea was 7·1 per cent., but in some areas reached 11·1 to 41·1 per cent. It is common in some parts of the Japanese islands. *Paragonimus* is present in Okinawa, and *S. japonicum* in parts of Japan. In Okayama Prefecture, Japan, RITCHIE *et al.* (p. 881) found *C. sinensis* in 3·9 to 40·3 per cent. of people examined. KOMIYA and KONDO (p. 1058) report natural infection with *C. sinensis* in *Anas domestica*, and (as a second intermediate host) in *Ophicephalus argus*.

A method for collecting metacercariae (of *C. sinensis* and other trematodes) from fish tissues is described by KOMIYA and MURASE (p. 976).

ZAHRA (p. 1059) shows that paragonimiasis is by no means uncommon in the Cameroons, where crabs and tadpoles are eaten insufficiently cooked. More women and children are affected than men; they by custom are the eaters of crabs. Paragonimiasis with metastasis in the brain is described by BUSCH and COOPER (p. 703).

LIE-KIAN-JOE (p. 65) reports *Haplorchis yokogawai* from man in Indonesia; it is common in the Philippines but rare in Indonesia. He also describes two new species of flukes, *Paralecithodendrium molenkampi* and *Phaneropsolus bonnei*, both in one man, who also harboured a species of *Plagiorchis*. The same author also reports *Plagiorchis javensis* from Indonesia.

SIGUIER *et al.* (p. 882) describe a case diagnosed as cerebral infection with *Dicrocoelium dendriticum*.

CESTODES

A comprehensive book on the tapeworms has been published by WARDLE and MCLEOD (p. 1011).

NEGHME and BERTIN (p. 526) give reasons for the opinion that *D. latum* is becoming more widespread in Chile, where salmon are infected. SANDARS (p. 417) reports *D. latum* in an Irish immigrant into Australia, and discusses the possibility of spread if it is introduced on a considerable scale into the country; potential intermediate hosts exist there. BACKHOUSE and BEARUP (p. 417) think the danger remote.

WEINSTEIN and APPELGET (p. 1136) infected dogs with *D. latum*, but failed with other animals. The infected fish had been kept on ice up to 46 days before successfully infecting the dogs.

BJÖRKENHEIM (p. 537) reports neurological developments in patients with pernicious tapeworm anaemia, noting that expulsion of the worm resulted in extensive remission of these neurological manifestations. They probably arise as a result of absorption of the neurotropically active substances by the worms. VON BONSDORFF (p. 418) finds that *D. latum* takes up extrinsic factor (vitamin B_{12}) from the intestinal contents in which it lives, thus depriving the host. The worm itself contains large amounts of this vitamin, and, in fact, dried worm substance can be used as a source of it. VON BONSDORFF and GORDIN (p. 418) show that, in *D. latum* anaemia, patients either respond to a haematinic (vitamin B_{12} or a liver extract) given by mouth alone, or do not respond even when gastric juice is added; in either case their behaviour differs from that of patients with Addisonian anaemia. Whether *D. latum* produces anaemia or not depends on its position in the intestine; if high, it either destroys the intrinsic or extrinsic factor, or prevents their interaction or absorption.

Areca nut has been used successfully in *D. latum* infection by FU *et al.* (p. 161), and by CHANG (p. 883).

A sparganum infection is reported from Texas by READ (p. 1059).

PRÉVOT *et al.* (p. 636) have estimated by X-ray the position usually taken up in the intestine by *T. saginata*, finding the first detectable segments 40–

50 cm. behind the duodeno-jejunal flexure. They discuss VON BONSDORFF'S method of localization of *D. latum* by aspiration of eggs through a duodenal sound, showing that this could give very misleading results.

BECK (p. 421) has studied the effect of diet on the behaviour of *H. diminuta* in rats.

Poisoning due to extract of *Filix mas* does occur occasionally, and is discussed by GREINER (p. 884) who shows that the symptoms are those of gastro-intestinal irritation followed by disturbances of the central nervous system.

HORNBOSTEL and DÖRKEN (p. 703) have used mepacrine (dose 0·8 gm. in 100 ml. distilled water followed half an hour later by a saline) for *T. saginata* infection, giving it by duodenal sound introduced to 70 cm. beyond the pylorus, and claim very good results. The worms are expelled whole, apparently paralysed, and having obviously taken up the drug extensively. Similar successful results are reported by PEREIRA (p. 1136) for *T. saginata*, and SCHAPIRO (p. 419). For *Hymenolepis nana*, however, BEAVER and SODEMAN (p. 884) found the drug useful in removing large numbers, but not curative in a single dose, and SCHAPIRO (p. 419) did not find it effective. NOR EL-DIN (p. 636) obtained success in only half of a series of patients treated for tapeworm infection with mepacrine, and even less with chloroquine. ARTEAGA CAMERO (p. 284), however, used chloroquine for *T. saginata* infection, with success in 5 of 7 patients.

CHUNG *et al.* (p. 66) report better results in the treatment of *T. solium* and *T. saginata* infections with a decoction of areca (betel) nut than with *Filix mas*, and they think that areca nut (which has been used in China for 1,400 years) is the treatment of choice.

Four cases of human infection with *Coenurus cerebralis* are reported from sheep-raising areas of South Africa by BECKER and JACOBSON (pp. 161, 419). Infection is due to swallowing eggs passed by dogs which harbour the adult *Multiceps multiceps*. There were signs of intracranial pressure, with focal symptoms and toxic psychosis. Operative removal of as many cysts as possible was undertaken, with improvement after stormy post-operative periods.

In the Near East the incidence of hydatid disease in sheep and cattle reaches almost 50 per cent. in some areas, and may be considerably higher in camels. Infection in the definitive hosts, dogs, apparently varies from 17 to 33 per cent. PIPKIN *et al.* (p. 421) think that human infection may be commoner than previously supposed.

NEGHME *et al.* (p. 705) discuss hydatid disease in Chile, where the incidence is increasing. The highest rates are in the south where cattle are plentiful. The authors discuss prevention. *Charles Wilcocks*

(*To be continued*)

MALARIA

EICHLER, W. Malariaerfahrungen in Griechenland. [**Experiences of Malaria in Greece**] *Riv. di Malariologia.* 1952, Dec., v. 31, Nos. 4/6, 109–28.

This paper is a record of the author's observations on the incidence of malaria and the breeding places of mosquitoes (*Anopheles maculipennis*, *A. maculipennis subalpinus*, *A. sacharovi* and *A. superpictus*) in 16 areas of Greece where he was stationed during 1941, 1942 and 1944 at the time of the German occupation. Details are given of the sort of climatic factors,

cultivation and irrigation customs, and small-scale topographical features which affected mosquito breeding and the malarial incidence in the population of each area. *D. S. Bertram*

BRUMPT, L. C. Les gamontes des plasmodium humains: *P. vivax* et *P. falciparum*. [**The Gamonts of the Human** *Plasmodium*, *P. vivax* **and** *P. falciparum*] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 734–9.

It is generally thought that those schizonts and merozoites of human malaria parasites which eventually give rise to the gametocytes are indistinguishable from the corresponding asexual stages. However, in the case of *P. vivax*, some authors have described differences between the asexual merozoites and the precursors of the sexual forms. The present author accepts CORRADETTI's view [this *Bulletin*, 1937, v. 34, 214], according to which the asexual segmenter fills the entire enlarged erythrocyte, the merozoites are arranged in the form of a morula, each being of irregular shape with an eccentric nucleus and a small vacuole, while the pigment is disposed in 2–4 eccentric masses. As regards the sexual segmenter, it does not occupy more than 2/3 of the host cell; the merozoites are arranged regularly, in concentric lines; they are of spherical shape with a central nucleus but without a vacuole; the pigment forms one central mass.

The study of this question in *P. falciparum* was carried out by the author in Indo-Chinese patients, in a series of films made from the blood of the skin, where mature schizonts can be readily detected. In these preparations were found unusual stages which the author regards as the precursors of the gametocytes, or gamonts. The youngest gamont, which is spherical, measures 2 μ in diameter, has a single nucleus and a small mass of pigment. As it grows, the gamont becomes oval, measuring $3{\cdot}5 \times 2{\cdot}5$ μ, with the nucleus at one pole and abundant pigment at the other. The host-cell measures 7×6 μ and is oval in shape. The next stage is represented by an oval form measuring 4×3 μ, with 2 nuclei separated by a voluminous central mass of pigment. The host-cell is reduced in size ($5{\cdot}5$ μ), of irregular shape and decolorized. The last stage contains 4 nuclei, 2 of which consist of several cherry-coloured chromatin masses, and 2 of one ruby-coloured mass. The host-cell is still more deformed and reduced in size ($4{\cdot}5 \times 3{\cdot}75$ μ).

Finally, the schizont undergoes segmentation, giving rise to 4 spindle-shaped bodies: 2 of these are precursors of microgametocytes, measuring $3{\cdot}5 - 4$ $\mu \times 1{\cdot}3$ μ, with a central granular nucleus; the other 2—regarded as precursors of macrogametocytes—are shorter ($2{\cdot}5 \times 2{\cdot}5$ μ), and their nucleus is situated near one of the poles.

The development of the gamonts appears to be rapid, for they were only seen in the course of one day.

[The reader's appreciation of the description of hitherto unknown stages in the development of the subtertian parasite is handicapped by the absence of illustrations.] *C. A. Hoare*

JEFFERY, G. M., WOLCOTT, G. B., YOUNG, M. D. & WILLIAMS, D., Jr. **Exo-Erythrocytic Stages of** *Plasmodium falciparum*. *Amer. J. Trop. Med. & Hyg.* 1952, Nov., v. 1, No. 6, 917–26, 12 figs. on 2 pls. (6 coloured).

The object of the experiments described in this paper was to determine whether *Plasmodium falciparum* underwent an exo-erythrocytic development in the liver. They were undertaken independently of SHORTT and his associates, whose successful results were reported while the present work was in progress.

Fourteen paretic patients were inoculated with sporozoites from infected mosquitoes, by bite, by intravenous injection or by both methods combined, over a period of 2 to 6 days. The species used were in most cases *Anopheles albimanus*, but in some *A. quadrimaculatus*. The sporozoite material inoculated was obtained from numbers of mosquitoes varying from 116 to 9,919. The results of the inoculations were assessed by microscopical examination of fixed and stained sections of portions of the liver removed with the aid of a peritoneoscope (12 cases) and by laparotomy (2), from 2 to 8 days after inoculation. Positive results were obtained only in one patient, who received the heaviest dose of sporozoites, whereas in the 13 others no parasites could be detected. This patient had been inoculated 4 days in succession by a total of 8,516 mosquito bites and 1,403 salivary glands. In samples of the liver obtained by laparotomy 3 to 6 days after inoculation, 125 parasites representing exo-erythrocytic stages were found within the parenchyma cells. They were similar to those described by SHORTT *et al.*, and are depicted in one coloured plate and in photomicrographs. *C. A. Hoare*

VISWANATHAN, D. K., RAO, T. R. & BHATIA, S. C. **The Validity of Estimation of *Anopheles* Densities on the Basis of Hand Collection on a Timed Basis from Fixed Catching Stations.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 199–213.

The reliability of different measures of anopheline density has long been a subject of discussion. In India traps have been found ineffective; hand catching techniques have been criticized as unreliable, giving a false picture of the constitution of the *Anopheles* population, and being too variable to be of value. Spray catching is thought to be reasonably accurate, but if often repeated may alter the characteristics of catching stations, and by killing mosquitoes prevent the estimation of oöcyst rates.

The validity of hand catching was carefully examined in 6 villages in Poona District. Well-trained collectors each caught mosquitoes for exactly 30 minutes, after which a careful spray catch was made. In all, 620 observations were made, and a total of 3,914 *Anopheles culicifacies* caught. The hand catch revealed 31·6 per cent. of the *A. culicifacies* population and 28·3 per cent. of the total anopheline population. Statistical analysis shows that the hand catch gave a useable and, indeed, reliable index of the total mosquito population and of its constitution. *G. Macdonald*

PAPPAS, G. D. & RUPPEL, R. F. **A Method of obtaining Axenic Larvae of *Anopheles quadrimaculatus*.** *Exper. Parasit.* New York. 1953, Apr., v. 2, No. 2, 147–9. [12 refs.]

In order to obtain axenic (bacteria-free) larvae of *Anopheles quadrimaculatus* the authors removed eggs from water in wire loops. The loops were then put into a specially prepared and sterilized box containing all necessary sterile equipment and fitted with germicidal lamp, window and elbow-length rubber gloves.

The eggs were washed from the loops with sterile distilled water into a glass tube fitted with organdie caps (the egg trap). By means of a wire holder the trap containing the eggs was immersed in a large tube of distilled water and agitated; this operation was repeated. After these two washings the trap was finally plunged into a tube containing antibiotic fluid. This fluid consisted of penicillin (2000 units/ml.) and dihydrostreptomycin (1 mgm./ml.) in sterile distilled water.

The eggs were released from the trap by removing one cap and allowing them to run into the mixture or into distilled water.

About 80 per cent. of the eggs hatched within 48 hours and it was found that all treated cultures were free of bacteria; but it is not possible to rear larvae to adults without any micro-organisms in the culture medium.

H. S. Leeson

SENIOR WHITE, R. A., LEWIS, G. & LEE, P. **On Swarming and Mating in** *Anopheles aquasalis* **Curry.** *Bull. Entom. Res.* 1953, Apr., v. 44, Pt. 1, 163–73, 1 fig. [14 refs.]

The authors' detailed and continued observations on the swarming of *Anopheles aquasalis* have been carried out for more than a year in Trinidad. They point out that swarming and mating are separate phenomena, both in this and other species of *Anopheles*; between species there are great differences in behaviour. A valuable table summarizes what is known of natural swarming in *Anopheles*. Even in an insectary 40 ft. × 20 ft. × 10 ft. high the present authors have failed to show that *aquasalis* will mate.

In the area which has been studied in detail swarms have been seen at many spots. One particular one was almost invariably chosen, over a grass-covered drain. The spot was very precisely defined and generally the swarm was over the grass about 2 ft. south of a particular post, but the point might move a yard or two. The time of swarming was also precisely defined, occurring some half-hour after sunset with differences of as much as 10 minutes. The act of swarming commenced when the light was below 5 foot-candles, the mean figure being about 2·5 f.c. Within a very few minutes the light became so dim that little or nothing could be observed. The authors gave a considerable amount of time to studying wet and dry bulb readings and other physical measurements without reaching a satisfactory explanation of the factors that might induce swarming. They found no evidence that swarming of *aquasalis* occurs at or about dawn.

In *A. aquasalis* a swarm is initiated by a few males circling at between 6 and 15 ft. from the ground. Other males quickly join the party and may bring the numbers in the swarm up to 600–800, a few individuals of another species sometimes taking part. A few females of *A. aquasalis* will also be found in the swarm, the number not exceeding 2 per cent. of the total. The authors found it difficult to observe the mating, which occurs a little later than the commencement of the swarm when the light is very dim. They did, however, succeed in observing mating in rather over half of 121 swarms which they watched. After mating has taken place the pair of mosquitoes do not drop immediately to the ground though they tend to drift out of the swarm down wind. On two occasions the authors released freshly bred virgin females into a swarm and on one occasion saw them fly straight into a swarm and pair.

The paper contains much valuable detail on *A. aquasalis* and a few notes on other species.

P. A. Buxton

CARAYON, A. Les accidents vasculaires et nerveux des injections intrafessières d'antipaludiques et leur traitement chirurgical. [**Surgery of Vascular and Nervous Complications after Intragluteal Injections of Anti-Malarials**] *Méd. Trop.* Marseilles. 1953, Jan.–Feb., v. 13, No. 1, 30–37.

In the tropics these complications usually follow intramuscular injection of the salts of quinine and the author in this study deals with infections

accompanying or provoking vascular and nervous complications. The occurrence of tetanus is not dealt with.

Vascular accidents may be classified as (1) *ischaemic*, (2) *haemorrhagic*. In the *ischaemic* group (a) transfixion of an artery during injection may lead to a spasm of short duration, or it may be so prolonged that it may result in infarction and gangrene or in the onset of Raynaud's syndrome. (b) Arterial embolism may be caused by injection into an artery of oily solutions of bismuth, rarely by quinine; the lesion resulting from the penetration of quinine into an artery is a massive chemical necrosis blocking the veins as well as the arteries. Soon after the injection pain is felt in the buttock and the skin becomes dusky and inflamed, the prognosis is less favourable than in the case of the bismuth injections. The seat of the lesions varies according to the vessels affected; if it is the trunk of the gluteal artery the gluteus maximus and subjacent muscles with the sciatic nerve are damaged, if it is the superficial branches only the upper part of the buttock will be affected and will become more or less gangrenous and cicatrization will be slow after elimination of the gangrenous tissues. Surgical excision of the damaged muscle has been tried, but may lead to severe secondary haemorrhage. (c) Periarterial injection provokes an intense spasm which has been held to explain the occurrence of deep necrosis without cutaneous involvement, which usually, but not always, varies according to the quantity injected and the degree of dilution. In the treatment of these ischaemic conditions the author advocates repeated sympathetic block to relieve the spasm.

(2) *Haemorrhagic* complications are due to ulceration into the lumen of an artery in the wall of an abscess cavity at the seat of necrosis, often secondarily infected, producing a large haematoma accompanied by fever, swelling and oozing of blood from the gluteal artery or its branches. Incision of the abscess may be followed by severe haemorrhage, so that it is necessary for the operator to have the necessary surgical equipment ready to hand for the ligation of main arteries. Repeated injections may so weaken the walls of the vessels in the inflamed muscles that they rupture, with the production of a traumatic aneurysm.

Nervous accidents. Lesions of the sciatic nerve are well known and the author has successfully practised neurolysis for their treatment in 5 of 9 cases seen personally. The nerve may be affected directly by the quinine solution, or there may be embolism, spasm or thrombosis of the nutrient arteries of the sciatic nerve, the anatomy of which is described. The author advises exploratory operation if 3–6 weeks of medical and physiotherapeutic treatment produce no improvement.

In conclusion he advises that the intramuscular injection of quinine should be abandoned except in cases where vomiting prevents the ingestion of the drug by mouth. *W. L. Harnett*

Copin, R., Jame, P. & Martin, J. R. Emploi de la flavoquine dans le traitement du paludisme. [**Flavoquine (Camoquin) in the Treatment of Malaria**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 769–76.

The subjects of this report were 42 passengers on board a troopship taking military personnel from Indo-China to France. The majority were undergoing normal repatriation on completion of their term of duty, but some were being repatriated on account of malaria. Theoretically, all these persons had been subjected to prophylaxis by proguanil or chloroquine [nivaquine] during their service in Indo-China. During the voyage from Saigon to Aden they were also supposedly under proguanil prophylaxis.

Among the 42 persons treated there were 39 cases of *P. vivax* malaria, 2 *P. falciparum* and 1 mixed *P. vivax* and *P. falciparum*. The majority (31) of the patients received a single dose treatment of 0·60 gm. (3 tablets) of amodiaquine (flavoquine, camoquin). In more severe cases a somewhat higher dosage was used, the highest being 1·0 gm. on each of 2 successive days. Except for 1 case in which it was thought to cause vomiting the drug was well tolerated.

The clinical response was satisfactory in the great majority of cases, and in all but 4 instances parasites were no longer found in the peripheral blood after 24 hours. The results are discussed in some detail and set out in a table. *G. Covell*

ADHIKARI, A. K. & GANGULI, N. **A Note on the Effect of Proguanil Suppression in Addition to other Control Measures on Bengal Nagpur Railway Stations.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 133–7, 1 map. & 5 charts.

There are difficulties in the control of malaria among railway staff in that their necessary movement takes them outside their protected home environment for long periods. Residual insecticides, therefore, do not secure complete control among them, a point realized when they were first brought into use. Proguanil has been used as a prophylactic, a single dose of 100 mgm. being given weekly to the staff of a number of stations of the Bengal-Nagpur Railway. The incidence of malaria for the 6 malarious months of the year is shown in a series of graphs covering the time before and after the start of this prophylaxis. The incidence among those who refused to take proguanil is used as a control. Results are presented as graphs only; from them it appears that the incidence is reduced by administration of proguanil. *G. Macdonald*

CHAUDHURI, R. N. & CHAKRAVARTY, N. K. **A Preliminary Note on the Prophylactic Value of Fortnightly Doses of Camoquin in Malaria.** *Indian Med. Gaz.* 1952, Oct., v. 87, No. 10, 453–4.

The authors and their colleagues in Calcutta have already reported on the suppressive action of weekly doses of camoquin in malaria prophylaxis [this *Bulletin*, 1952, v. 49, 595]. As camoquin is eliminated slowly they have now studied the possibilities of giving it at longer intervals.

Accordingly in 1951, camoquin was given to 125 people in villages during the malaria transmission season (June to December). Persons in neighbouring villages acted as controls; a few of these had occasional small doses of quinine for acute attacks.

The camoquin was given once a fortnight under direct supervision, the dose being 0·4 gm. for those aged 12 or over and 0·2 gm. for those under 12.

The results are shown in a table. The parasite rate in the control group rose from 7·9 per cent. in June to 23·6 in November, while the rate in those treated with camoquin fell from 8·6 to 1·8. The lowest rate in the treated group was 0·95 in September, during which month the controls showed a rate of 11·5.

In the last month, December, the parasite rate in the camoquin group, however, rose to 4·3: this is attributed to a failure of supply of the drug, which had been withheld for 6 weeks. On the other hand, the authors cannot explain a rapid fall of the parasite rate to 10·8 per cent. in the control group in December, other than to suggest that the high incidence

of malaria in the previous month had caused many of the subjects to take anti-malarial drugs on their own initiative.

In those treated, the incidence of fever was much reduced and health improved. There was an impression that the size of the spleen had diminished in many cases, but this was not studied systematically. No anti-mosquito or other control measures were taken in the area during the investigation and the authors conclude that fortnightly doses of camoquin gave considerable protection from malaria even without such measures.

H. J. O'D. Burke-Gaffney

MERCIER, S. La prophylaxie du paludisme à Tananarive en 1951. Incidences épidémiologiques et démographiques. [**Epidemiological and Demographic Results of Malaria Control in Tananarive in 1951**] *Rev. Paludisme et Méd. Trop.* 1953, Feb. 15, v. 11, No. 104, 26–36, 5 graphs.

The general picture and preliminary results of a malaria control programme in Tananarive, Madagascar, have been previously reported [this *Bulletin*, 1952, v. 49, 752], and the present report continues the story for another year. The campaign is primarily based on the use of DDT in a dose of 1·2 gm. (suspension) or 2 gm. (solution) to a square metre, though BHC in a dose of 0·1 gm. of the *gamma* isomer to a square metre has also been used. Chemoprophylaxis appears also to have been practised among schoolchildren. The malaria death rate per 100,000, previously reduced from 412 to 118, was 69 in 1951, while the general death rate showed further decrease and is now less than half of the rate before control. The previous seasonal peak of mortality, both general and specifically malarial, has completely disappeared. The author analyses by age-groups the deaths accredited to malaria before and during control; the greatest absolute mortality and absolute reduction were among infants and children under 5, but the greatest relative decrease has been among those aged 5 to 15. The success in reduction of mortality is dramatic and convincing.

G. Macdonald

SUBRAMANIAN, R. & VAID, B. K. **Some Observations on Rural Malaria Control using Residual Insecticides in Wettable Powder Form.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 215–8.

Work was carried out in an area in India, Madhya Pradesh (once the Central Provinces), where the principal vector is *A. fluviatilis*, and where *A. culicifacies* plays a subsidiary rôle. Malaria is endemic, spleen rates being about 25 per cent. and infant parasite rates up to 60 per cent. Two applications of DDT wettable powder at a dose of 56 mgm. per square foot were made in 1949 and again in 1950. In 1951 a wettable powder of BHC was substituted, the dose being 11 gm. of the *gamma* isomer per square foot; spraying was carried out in July-August and in September. Spleen rates showed satisfactory reductions and the infant parasite rate in a treated town fell to a negligible figure. In the neighbouring treated villages the rate remained material at 2·4 in July, 1951, 10 in November, 1951, and 23 per cent. in February, 1952, the figures in untreated villages being 0, 60 and 32·5 per cent. Dispensary figures showed a marked reduction in the total attendances though the reduction in those recorded as malaria was unsatisfactory.

It is concluded that in this area 2 applications of 11 gm. of *gamma* BHC per square foot during the malaria season are not adequate to eliminate active malaria transmission. It appears that dosage must be increased and more applications made.

G. Macdonald

EJERCITO, A. *Modus operandi* **in the Control of Malaria under Philippine Conditions.** *J. Philippine Med. Ass.* 1952, Dec., v. 28, No. 12, 683–90.

The author gives a broad account of malaria as it occurs in the Philippine Islands and the strategy and tactics of control. He does not wish to abandon the proved methods of careful survey and considers all available techniques including control of breeding whether by chemical, biological or mechanical means, and re-states the place of each. The residual insecticides are to have their place but only as an integrated part of a general scheme and not in general substitution of older measures.

[Ejercito keeps alive principles now largely ignored; the reviewer thinks he is correct, providing he gives a proper place to new methods, as the ultimate solution of malaria problems in the Philippine Islands may well incorporate measures now unfashionable.] *G. Macdonald*

JASWANT SINGH, RAY, A. P., BASU, P. C. & MISRA, B. G. **Effect of Parenteral Administration of Antimalarials in Simian Malaria.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 163–73, 1 chart. [34 refs.]

In this investigation the results of administering quinine, mepacrine [atebrin], NAB, quinarsol and chloroquine intravenously to rhesus monkeys infected with *P. cynomolgi* have been compared. Acute toxic symptoms resulting from overdosage are described. In all, 54 monkeys were used, 32 of which were inoculated with the plasmodium. The administration of drugs was delayed till the sixth day after inoculation when parasitaemia had reached 10 to 20 per cent. of the red cells present. To assess activity, comparison of the parasitaemia in experimental animals and controls was made on the day after treatment. Splenectomy was employed to determine whether cure had been effected. The results indicated that quinine, mepacrine, and chloroquine were very active at dosages based on body weight corresponding to that employed in human malarial infections, but this was not the case with NAB or quinarsol. Chloroquine proved most active of all on a dose-for-dose basis. When all factors, such as toxicity, speed of action, etc., were considered it appeared that only chloroquine and quinine could be used satisfactorily by the intravenous route.

J. D. Fulton

COUDERT, J. & CHASTEL, C. Note sur la morphologie du *Plasmodium berghei* Vincke et Lips observé au microscope en contraste de phase. [**Structure of** *Plasmodium berghei* **observed with Phase-Contrast Microscope**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 740–3, 1 fig.

The authors describe the appearance and behaviour of living *Plasmodium berghei* as seen under the phase-contrast microscope. The parasitized red cells can be readily distinguished from normal ones: the latter are highly refringent at the periphery and have a dark central zone; the former, which are 2–3 times larger, are pale, non-refringent, and without a peripheral halo.

Within the cells the young parasites and schizonts are in extremely active locomotion, while the movements of the amoeboid forms and mature schizonts are slow. In segmenters the motility of the merozoites is comparable to that of the trophozoites. On the other hand, the gametocytes appear to be motionless. The phase-contrast system also reveals the internal structure of the parasites: nucleus, pigment, etc. If the preparation is allowed to stand for 2–3 hours, exflagellation can be clearly observed. There are 9 photomicrographs purporting [unsuccessfully] to illustrate the various structures seen in the preparations. *C. A. Hoare*

MERCADO, Teresa I. & COATNEY G. R. **The Course of the Blood-Induced** *Plasmodium berghei* **Infection in the Meadow Mouse** *Microtus pennsylvanicus pennsylvanicus* **and certain other Small Rodents.** *Amer. J. Trop. Med. & Hyg.* 1953, Jan., v. 2, No. 1, 39–46, 1 fig. [22 refs.]

Various species of rodents were infected with the KBG 173 strain of *Plasmodium berghei* by intravenous inoculation of half a million parasitized erythrocytes. The meadow-mouse (*Microtus pennsylvanicus*) responded by a 33 per cent. death rate after a parasitaemia lasting an average of 4 days; in recovered mice, the patent period, as revealed by blood films, was nearly 7 days, but the infection was shown to persist, by blood inoculations into white mice, for as long as 51 days. The number of merozoites in mature schizonts varied from 4 to 8. The following rodents also proved susceptible in varying degrees to the infection:—*Oryzomys palustris*, 3 species of *Perognathus* in 2 of which the mortality was 100 per cent., 2 species of *Dipodomys*, *Sigmodon hispidus* [this *Bulletin*, 1950, v. 47, 523] and *Acomys cahirinus*. *P. C. C. Garnham*

SINGER, I. **The Effect of X Irradiation on Infections with** *Plasmodium berghei* **in the White Mouse.** *J. Infect. Dis.* 1953, Jan.–Feb., v. 92, No. 1, 97–104, 5 figs.

The effect of X-ray irradiation on *Plasmodium berghei* was studied in mice inoculated intravenously with 12½ million parasites and exposed in celluloid tubes at about 75 cm. from the X-ray machine. The animals were irradiated 1 day before and from 1 to 7 days after infection. When 550r were administered up to the 3rd day of infection, a low parasitaemia was produced in the infected mice, reaching its peak on the 5th day, and then dropping below 10 parasites per 10,000 red cells until the animals died. When the same dose was given on the 5th or 7th day, parasitaemia never fell below 40 parasites for the same number of red cells, and rose to 2,000–6,000 before the host's death. Doses of 250r administered before infection resulted in an infection comparable to that in the controls. When the mice were exposed to this dose after infection, there was a rise in parasitaemia 24 hours later, but afterwards it fell below the level in the controls.

In view of the preference of *P. berghei* for immature erythrocytes and the damage caused by X-rays to the erythrogenic system, the above results are thought to be due to failure of the host to supply these cells.

C. A. Hoare

FABIANI, G. & IZZO, M. A. Le test de Thorn dans le paludisme expérimental du rat blanc à *Plasmodium berghei*. [**Thorn's Test in** *Plasmodium berghei* **Infections in the White Rat**] *C. R. Soc. Biol.* 1952, Aug., v. 146, Nos. 15/16, 1153–5.

Twenty-four white rats, between 100 and 150 grammes in weight, were infected with *Plasmodium berghei*. Two mgm. of ACTH (Armour) were inoculated intraperitoneally in each rat at different stages of the disease. In the first stage when parasitaemia was low, the Thorn test (percentage diminution of eosinophiles in films taken 4 hours after, as compared with films taken immediately before, the injection of the hormone) was positive; during the second and third stages, when the infection was fully developed and during the crisis, the test was negative; during the fourth stage of decline, the test again became positive. Injections of ACTH to 4 or 5 rats in the third and fourth stages of infection produced an increase of parasitaemia.

P. C. C. Garnham

FABIANI, G. & IZZO, M. A. Influence de la surrénalectomie sur le paludisme du rat blanc infecté expérimentalement par *Plasmodium berghei*. [**Effect of Adrenalectomy on White Rats infected with** *Plasmodium berghei*] *C. R. Soc. Biol.* 1952, Aug., v. 146, Nos. 15/16, 1155–7.

The effect of surgical removal of the adrenal glands was observed in 27 rats (a) when the operation was performed 2 days, 1 day or 1 hour before infection with *P. berghei* or (b) after inoculation. Adrenalectomy kills uninfected rats in 6 or 7 days. The removal of the glands first affected parasitaemia when it was carried out during the early stage of infection—then, the density stayed low and the infection rapidly declined. This effect could be neutralized by daily injections of the hormone and the infections subsequently pursued a normal course. Later in the disease, adrenalectomy caused a fatal outcome 12 to 18 hours after the operation, and if carried out after the crisis, it caused a rise in parasitaemia and death in 1 or 2 days.

P. C. C. Garnham

VARGUES, R. & FABIANI, G. Étude sérologique de l'infection expérimentale du rat blanc par *Plasmodium berghei*. La fiche réticulo-endothéliale de Sandor et l'euglobuline I_1. [**Serological Study of Experimental Infections of** *Plasmodium berghei* **in the White Rat. Reticulo-endothelial Index of Sandor and Euglobulin I^1**] *C. R. Soc. Biol.* 1952, Aug., v. 146, Nos. 15/16, 1161–4, 3 charts.

Sandor's technique was modified to enable small quantities of serum to be tested. The serum (0·1 ml.) is agitated for 30 minutes with Sørensen's buffer solution (2 ml. at 7·6 *p*H) plus varying quantities of N/20 HCl. The opacity and *p*H of each tube are then measured and plotted against each other on a graph. In normal rats, the maximum precipitate lies between *p*H 5·7 and 5·9 and is never visible above 6·8; in rats in the acute stage of malaria, the maximum lies about *p*H 6·3 and precipitation is always seen in the first tube (*i.e.*, with no acid, at *p*H 7·6). Fifteen days after cure, the curve returns to normal. A single rat which had had its spleen removed, and a partial adrenalectomy performed, failed to show this response during a fatal relapse of malaria [? due to reticulo-endothelial hypoplasia]. Precipitation at *p*H 7·6 signifies the presence of the pathological euglobulin I^1, which is never present in normal sera. In rat malaria it appears on the 4th day of the disease, reaches a maximum at the crisis, and disappears 10 days after cure. Euglobulin I^1 of rat sera is destroyed by the action of heat—after 30 minutes' exposure to a temperature of 56°C. *P. C. C. Garnham*

FABIANI, G. & VÉRAIN, A. Intérêt de l'injection massive de parasites (*Plasmodium berghei*) chez le rat blanc, pour établir un test d'activité d'un médicament antimalarique (nivaquine). [**The Importance of Using Large Inocula of Parasites** (*Plasmodium berghei*) **in the Measurement of Anti-Malarial Activity of a Drug (Nivaquine [Chloroquine]) in White Rats**] *C. R. Soc. Biol.* 1952, Aug., v. 146, Nos. 15/16, 1158–61, 1 chart.

White rats, weighing 120 to 165 gm., were given a single subcutaneous dose of nivaquine [chloroquine], the amount varying from 0.01 mgm. to 40 mgm. per 100 gm. weight. Doses beyond 20 mgm. were toxic and beyond 35 mgm. were fatal. One hour after dosing, injections of blood containing *Plasmodium berghei* were given intraperitoneally, the number of parasitized

cells varying from 280 to 600 millions per injection. With this heavy inoculum, no prepatent period occurs, and parasitaemia was measured 1 hour after injection, then 3, 6, 9, 12, 15, 18, 21, 24, 30, 48 hours, etc. onwards. During the first 12 hours, parasitaemia increased at comparable rates in treated and untreated rats; thereafter, the dosage of nivaquine influenced the result: an optimum dose of 0·5–2 mgm. caused the parasite count to drop between the 12th and 15th hours and to reach zero in 3 or 4 days, a dose of 0·1 mgm. or less was apparently ineffective, a toxic dose delayed the drop in parasitaemia until the 15th or 18th hour and cure was slower. Mild relapses always ensued: they occurred earliest with the smaller doses of nivaquine (1 day after 0·7 mgm.), and latest with the larger (16 days after 30 mgm.). *P. C. C. Garnham*

DRAPER, C. C. *Plasmodium berghei*, **Vincke & Lips, 1948. A Bibliography of Published Papers up to April, 1953.** 10 mimeographed pp. [104 refs.] 1953, May 1. London: Ross Institute, Keppel St., W.C.1.

This bibliography of 104 entries is issued by the Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, in mimeograph form, and copies can be obtained by writing to the Secretary. It is a most useful list of titles.

Dr. Draper prefaces the list with 4 paragraphs on discovery and natural history, studies on morphology, etc., laboratory transmission, and chemotherapy.

Most of the papers cited have been abstracted in this *Bulletin*.

Charles Wilcocks

MCGHEE, R. B. **The Influence of Age of the Animal upon the Susceptibility of Mammalian Erythrocytes to Infection by the Avian Malaria Parasite** *Plasmodium lophurae*. *J. Infect. Dis.* 1953, Jan.–Feb., v. 92, No. 1, 4–9, 2 figs. [13 refs.]

In a previous paper the author [this *Bulletin*, 1950, v. 47, 1184] dealt with the susceptibility of erythrocytes from different animals to infection with the avian parasite *Plasmodium lophurae* when inoculated into infected chick embryos. The experiments described in the present paper were undertaken in order to determine whether erythrocytes from adult and infant mammals (rats, mice, man, sheep and guineapigs) differed in their susceptibility to infection with the avian parasite.

Heparinized samples of mammalian blood were washed in saline, and 0·1–0·2 ml. of saline suspension was injected intravenously into chick embryos which had been inoculated with the malaria parasites 2–3 days previously. The results were assessed by examination of stained blood films made at various intervals after the injection. *In vivo* tests were also made by inoculating the murines with infected chick embryo blood.

While the red cells of man, guineapigs and sheep were refractory to infection, the erythrocytes of infant rats and mice proved to be more susceptible than those of adult animals. Appreciable infections were also produced in the young rodents *in vivo*. In the murine erythrocytes the parasites underwent asexual development with schizogony giving rise to 9–12 merozoites, and in some cases gametocytes were also observed.

C. A. Hoare

HERBIG-SANDREUTER, A. Untersuchungen über den Einfluss des Höhenklimas auf Hühnermalaria (*Plasmodium gallinaceum*, Brumpt). [**The Climatic Influence of High Altitudes on Fowl Malaria** (*Plasmodium gallinaceum*)] *Acta Tropica*. Basle. 1953, v. 10, No. 1, 1–27, 2 figs. [13 refs.]

The author studied the effect of the climate at high altitudes on the course of malaria in 135 chicks (8-day) infected with *Plasmodium gallinaceum*, by inoculation of sporozoites from *Aëdes aegypti*. These investigations were carried out in Switzerland at the High Alpine Research Station of Jungfraujoch (altitude 3,475 m.), with controls in Basle (318 m.). One batch of chicks was infected at different periods before being sent to the station, while another was allowed to become acclimatized to the high altitude before the inoculation. The development of the parasites in the mosquito was studied under similar conditions.

The influence of the high altitude on the course of infection was observed only in those chicks which were brought to Jungfraujoch at least 3 days before parasitaemia was expected (7–9th days after inoculation), during which period adaptation to the high altitude had taken place. The high altitude affected the course of malaria in the chicks as follows: (1) by early suppression of the infection, or (2) by its retardation, as shown by the prolongation of the incubation period, resulting in the later appearance of both the exo-erythrocytic and erythrocytic schizonts. However, the blood infection, once established, did not differ from that at Basle.

It is concluded that conditions at high altitudes have an indirect effect upon the exo-erythrocytic development of the parasite, which is due to an increased resistance of the host, but the exact nature of the effect upon the blood forms is not clear, though there is a definite correlation between the increase of haemoglobin and the retardation of parasitaemia.

As regards the mosquito, under favourable conditions of temperature and humidity its efficiency as a vector is not affected by high altitude, even when the infection was acquired in the lowlands. *C. A. Hoare*

RICHESON, Edna M., HIGHMAN, B., GREENBERG, J. & COATNEY, G. R. **Strain Differences in** *Plasmodium gallinaceum* **Brumpt. V. Further Characteristics of the BI Strain.** *Amer. J. Hyg.* 1953, Jan., v. 57, No. 1, 114–24, 4 figs. [23 refs.]

This paper represents a study of the effect on 6- to 12-day-old chicks of predominantly exo-erythrocytic infections of *Plasmodium gallinaceum* (BI strain), maintained by bi-weekly intramuscular inoculations of brain tissue. The parasitaemia was never more than 1 per cent., nevertheless the red blood count and haemoglobin content progressively fell during the course of infection; the chicks did not grow normally, and the spleens doubled in size (chiefly owing to hyperplasia of the red pulp). Parasites did not appear until 9 days after inoculation, they then became numerous in the brain and lung, while a few appeared in the spleen and heart. A slight to marked inflammatory reaction occurred in the epicardium and myocardium of the heart, which were infiltrated by lymphocytes, monocytes and polymorphonuclear leucocytes; the parasites were found in endothelial cells, and some were thought to be inside muscle cells. *P. C. C. Garnham*

ANDERSON, C. R. **Continuous Propagation of** *Plasmodium gallinaceum* **in Chicken Erythrocytes.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 234–42.

A method of growing *Plasmodium gallinaceum* in culture is described. The basic technique was to seed a heparinized chicken erythrocyte medium (plus penicillin and glucose) with parasitized cells (obtained from chicks showing highly "phasic" infections), to maintain the culture in a 7 per cent. CO_2:93 per cent. air atmosphere, rocking at 13 cycles per minute, at a temperature of 40°–42°C., and to subculture every day by mixing 1 part of culture with 5 parts of freshly prepared erythrocyte suspension. The following modifications affected growth: (1) halving the concentration of erythrocytes had an inhibitory effect, (2) replacing plasma by a dialysed chicken erythrocyte extract plus plasma dialysate increased the multiplication rate, and (3) heating the plasma to 56°C. for an hour before seeding improved the growth rate and the "healthiness" of the parasites. The second and third modifications were embodied in the routine, and by the use of this method 10 successive subcultures were performed, the parasite density remaining approximately constant (though the original culture was ultimately diluted nearly 20,000 times), and the parasites even regaining a degree of periodicity towards the end of the series. Schizonts and gametocytes were present throughout, and the cultures proved infective on inoculation into chicks. *P. C. C. Garnham*

JASWANT SINGH, BASU, P. C. & RAY, A. P. **Screening of Antimalarials against** *P. gallinaceum* **in Chicks. Part I. Preliminary Studies.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 145–58, 4 charts. [17 refs.]

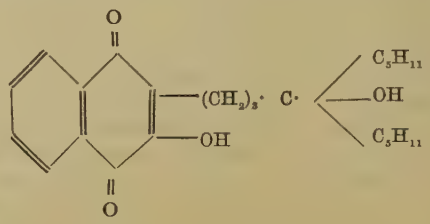
A centre has been established at the Malaria Institute of India for the screening of anti-malarial drugs against *P. gallinaceum* infection of chicks. The present record of preliminary observations on the course of infection in control animals after inocula of different amounts of infective material, and on the effect of standard drugs in comparison with quinine against the parasite, was made to provide standards for use in the course of future testing.

White leghorn chicks 7 to 12 days old, weighing 40 to 90 gm., were inoculated intravenously or subcutaneously with infected blood or sporozoites. In order to calculate the quinine equivalents the MED (minimum effective dose) of each drug was determined, and is defined as the smallest dose of drug which will reduce parasitaemia to 25 per cent. of that in control birds. The quinine equivalent was the ratio of the MED for this substance to that of the drug under test. The general procedure was similar to that of CURD *et al.* [this *Bulletin*, 1946, v. 43, 394]. The data on these different aspects of the investigation are recorded. The drugs used besides quinine were mepacrine [atebrin], chloroquine, amodiaquin [camoquin], sulphadiazine, pamaquin [plasmoquine], and proguanil [paludrine]. The prophylactic activity of the last 3 was determined. *J. D. Fulton*

RAY, A. P., BASU, P. C. & JASWANT SINGH. **Prophylactic Trial with Lapinone against** *P. gallinaceum* **in Fowls.** *Indian J. Malariology.* 1952, June, v. 6, No. 2, 159–62. [13 refs.]

Lapinone, a naphthoquinone of the following constitution, which was synthesized by FIESER *et al.* [this *Bulletin*, 1949, v. 46, 115], has been

tested against sporozoite-induced *P. gallinaceum* infection of fowls weighing 0·5 to 1·5 kgm. Infection was produced by suspensions of infected mosquito glands injected into the wing vein. From the fourth day after inoculation till the fourth week stained blood smears were examined. Intramuscular injections of the drug in olive oil were given, beginning within an hour of inoculation and thereafter twice a day for the 3 following days.



The prolongation of the incubation period was used as a criterion of activity. In no case did Lapinone give complete protection, even when 30 mgm. per kgm. was administered, but this dose and also half the amount gave rise to prolongation of the prepatent period. It appeared to have no action on pre-erythrocytic forms. *J. D. Fulton*

Baranger, P. & Filer, M. K. De l'action protectrice des colliers dans la malaria aviaire. Essai d'ethnographie expérimentale. [Miscellanea.] [**The Protective Action of Necklaces in Bird Malaria**] *Acta Tropica.* Basle. 1953, v. 10, No. 1, 69–72, 1 fig.

Both primitive peoples and some European peasants believe that necklaces, bracelets, etc., protect them against various diseases. The authors set out to verify these claims in the case of chicks infected with *Plasmodium gallinaceum*, using metal bands in the form of open or closed rings, or spirals, as well as textile rings. The metals were gold, silver, copper, iron, tin, zinc, aluminium, nickel, lead, magnesium, manganese, molybdenum and alloys (Ni + Fe + Cr + Mn, Cu + Zn, Cu + Ni + Zn).

The results are given in two tables, showing the effect on exo-erythrocytic and erythrocytic forms of the parasite. It is claimed that gold, copper and iron bands prolonged the life of birds with an EE infection from the normal 11·6 days to 20–30 days, and retarded the appearance of blood forms beyond 16 days in 30–70 per cent. Other metals had a less marked or no effect. In the case of blood infections, all the metal bands produced a diminution of parasitaemia and prolonged the life of the birds, this effect being most pronounced in the case of gold, silver, copper and iron. It was observed that the loss of the necklace was followed next day by increased parasitaemia.

Necklaces of textile materials had slight or no effect on the infection.

C. A. Hoare

Love, G. J., Wilkin, Sara A. & Goodwin, M. H., Jr. **Incidence of Blood Parasites in Birds collected in Southwestern Georgia.** *J. Parasitology.* 1953, Feb., v. 39, No. 1, 52–7. [11 refs.]

From 1947 to 1952, the authors examined 1,246 wild birds in Georgia, U.S.A., for the presence of blood parasites. Of these, 150 were bled and the blood was inoculated into canaries, when 2 latent infections of malaria

parasites were revealed. Microfilariae (44) were detected 4 times as frequently in heart as in peripheral blood. *Plasmodium relictum* (or *cathemerium*) was found in 83 birds, *P. elongatum* in 26, *P. circumflexum* in 10, *P. hexamerium* in 1; *Haemoproteus* was found in 178, *Leucocytozoon* only in 4, and trypanosomes in 9. There were 30 new host records.

P. C. C. Garnham

MANWELL, R. D. & GLENN, S. **Further Studies on the Cultivation of the Avian Malaria Parasites.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 227–33.

Plasmodium hexamerium, *P. cathemerium* and *P. relictum* were cultured in the Harvard medium [this *Bulletin*, 1951, v. 48, 335]. The first parasite belongs to a special group of avian malaria parasites of small size and having few merozoites; the second and third are large parasites with many merozoites. *P. hexamerium* grew and survived well even up to 72 hours, and multiplied in subculture *P. relictum* showed variable growth, and *P. cathemerium* was least successful. Results were assessed on (a) the ratio of parasitized cells before and after culture (growth index), (b) staining characters, and (c) prepatent periods and nature of infection in subinoculated birds (viability index). *P. C. C. Garnham*

HUNNINEN, A. V. **Comparative Development of** *Plasmodium relictum* **Oocysts in** *Anopheles quadrimaculatus*, *A. albimanus*, **and** *Culex pipiens*. *J. Parasitology*. 1953, Feb., v. 39, No. 1, 28–32, 1 fig.

The susceptibility of *Anopheles quadrimaculatus* and *A. albimanus* to *Plasmodium relictum* (in sparrows) was compared with that of *Culex pipiens*. The infection (oöcyst) rate and average oöcyst density were as follows:—*C. pipiens*—80 per cent. with 236 oöcysts; *A. albimanus*—80 per cent. with 79 oöcysts; and *A. quadrimaculatus*—73 per cent. with 207 oöcysts. Oöcysts grew most quickly in the *Culex*, sporozoites appearing in large numbers on the 6th–8th day; oöcyst growth was much the same in *A. quadrimaculatus* though it showed an inexplicable regression after the 8th day, and sporozoites were scantier; oöcyst growth in *A. albimanus* was much delayed and maturity was not reached until the 9th–11th days after which more than half the specimens exhibited sporozoites. *P. C. C. Garnham*

TRYPANOSOMIASIS

TRINCÃO, C., GOUVEIA, E., FRANCO, A. & PARREIRA, F. Ferro, cobre e zinco no soro dos doentes do sono. [**Serum Levels of Iron, Copper and Zinc in Cases of Sleeping Sickness**] *Gaz. Méd. Portuguesa*. 1953, v. 6, No. 1, 117–21.

The English summary appended to the paper is as follows:—

"In sleeping sickness contrariwise to most of the other infections serum iron levels are normal and the same can be said about serum copper and serum zinc values.

" After oral administration of iron to these patients the serum iron values come back to the initial values more quickly than in normal subjects. The same was observed when a trivalent iron salt was injected intravenously.

" Serum copper variations after iron administration are inverse to those of the serum iron though no coincidence exists between the higher values of one of the elements and the lower ones of the other.

" Serum zinc variations seem to be irrespective of those of the other 2 elements."

TRINCÃO, C., PARREIRA, F., GOUVEIA, E. & FRANCO, A. O fibrinogénio do plasma na doença do sono. [**Plasma Fibrinogen in Sleeping Sickness**] *Gaz. Méd. Portuguesa.* 1953, v. 6, No. 1, 121–2.

The English summary appended to the paper is as follows:—

" In a lot of 6 untreated sleeping sickness cases, the writers have performed the determination of the plasma fibrinogen in comparison with that of the erythrocyte sedimentation rate.

" Plasma fibrinogen was high in every case but there seemed to be no relationship between its elevation and that of the erythrocyte sedimentation rate."

EAGLE, H. & DOAK, G. O. **The Biological Activity of Arsenosobenzenes in relation to their Structure.** *Pharmacol. Rev.* 1951, June, v. 3, No. 2, 107–43, 6 figs. [130 refs.]

This is a comprehensive review dealing with " the toxicity and parasiticidal activity of arsenosobenzenes in relation to the substituent groups on the benzene ring, preliminary to a discussion of their mode of action ". Much of the work quoted has already been abstracted in this *Bulletin*, but an idea of the scope may be indicated from the authors' contents index:

" I. General Considerations.
II. The Biological Activity of Substituted Arsenosobenzenes.
  A. Activity in Relation to Structure.
  B. The Selective Parasiticidal Action of the Arsenosobenzenes.
  C. Time-Dosage Relationship.
III. Mode of Action of Arsenoso Compounds.
  A. The Reactivity of Arsenicals with Thiols.
  B. The Reactivity of Arsenosobenzenes with -SH groups in Enzymes.
  C. Other Arsenic-Detoxifying Mechanisms.
  D. Possible Explanations for the Varying Reactivity of Different Arsenicals Against the Same Organism, and of the Same Arsenical Against Different Organisms.
IV. Summary."

[On p. 130 and in the latter half of Table 8, the authors, referring to the work of WILLIAMSON and LOURIE [this *Bulletin*, 1948, v. 45, 413], incorrectly state that the parasiticidal action of " Melarsen oxide " is inhibited by its quinquevalent analogue " Melarsen "; presumably " *melamine* ", not " *Melarsen* ", is intended here, for in the reference cited, the former compound (but not the latter) was shown to be antagonistic to " Melarsen oxide ".]

J. Williamson

LOURIE, E. M. **Combined Treatment by Suramin (Moranyl) and Pentamidine, providing a Situation Unique in Therapeutics and with Potential Advantages in the Prophylaxis of Sleeping Sickness.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase. No. 160/O.* Léopoldville (Congo Belge). 1951. 4 mimeographed pp. [I. S. C. T. R. (51) 6.]

In experiments on laboratory animals and their isolated tissues GUIMARAES and LOURIE [this *Bulletin*, 1952, v. 49, 126] found that suramin could inhibit some immediate pharmacological and toxic effects of pentamidine, *viz.*, fall of blood-pressure, broncho-constriction, contraction of gut, depression of neuro-muscular transmission, paralysis in frogs, and toxicity for mice. The inhibition is due to the formation of a suramin-pentamidine salt-complex which acts during the short period of maximum concentration of pentamidine in the body. The therapeutic activity of pentamidine, however, was not inhibited by suramin because, in the author's opinion, chemotherapeutic activity of either drug is exerted at much lower concentrations and the trypanosomes were exposed to these low concentrations for a long time. This view is supported by the fact that a single injection of either drug will prevent infection for several months. The suramin-pentamidine salt would become dissociated during the long period of therapeutic activity and each drug should then act independently.

The author does not think that combined treatment of sleeping sickness with the two drugs would be very advantageous because each drug is fully effective in the early stage of *T. gambiense* infection, though it might enable a slightly increased dose of pentamidine to be safely given, thereby shortening the course of treatment. But it might be very useful for mass prophylaxis; a dose of suramin, followed in a few hours by a dose of pentamidine slightly larger than usual, might be sufficient, the usual second injection some months later being then unnecessary. This would effect a great saving in expense. The experimental work suggests that such a scheme would be safe, but whether the additive, or possibly synergistic, prophylactic effects would result or not is more doubtful. Before any large-scale prophylaxis in the field is attempted, work with laboratory infections should be done and the author hopes to be able to undertake such an investigation. This case, of two compounds, one annulling the other's toxic effects, yet acting together therapeutically, seems to be unique in therapeutics. *J. F. Corson*

BEAUDIMENT, R. & ZOZOL, R. **Clinical Trial on the Buffer Effect of Moranyl on Lomidine in View of its Application to Mass-Prophylaxis and eventually to the Treatment of the Lymph and Blood Period.** *Bureau Permanent Interafricain de la Tsé-Tsé et de la Trypanosomiase. No. 193/T.* Léopoldville (Congo Belge). 1952, Oct. 10, 11 mimeographed pp.

The clinical trials described in this paper were suggested by the opinion of LOURIE [see above, 1953, p. 687], based on animal experiments, that the safe dose of pentamidine could probably be increased if a dose of suramin were given a few hours earlier. The authors made 4 different trials with moranyl [suramin] and lomidine [dimethane sulphonate of pentamidine base]. In the first trial 4 African patients with trypanosomes in their blood were each given moranyl 0·5 gm. intravenously, and 6 hours later received intravenous injections of 5, 6, 7 and 8 mgm./kgm. of lomidine respectively; no reaction followed and the trypanosomes disappeared from

the blood. In the second trial the intervals between the doses of moranyl (0·5 gm.) and lomidine (8 mgm./kgm.) were 5, 4, 3, 1, ½ and 0 hours respectively in 6 patients; the patient with the half-hour interval vomited after a few minutes and had colic lasting for several hours, and the patient with the 4-hour interval had severe headache next day, but in both cases the reactions were attributed to personal sensitivity to lomidine. In the third trial, moranyl 0·5 gm. and lomidine 8 mgm./kgm. were injected simultaneously, one into each buttock, of an African patient and there was no reaction. In the fourth trial, moranyl 0·01 gm./kgm. and lomidine 8 mgm./kgm. were mixed together and injected into an infected guineapig [route not mentioned]; the injection was well borne and trypanosomes disappeared from the blood. When the moranyl and lomidine were mixed together a precipitate of unknown composition was at once formed.

The authors conclude that the results of the trials confirm Lourie's view and they point out the advantages which this method should have in mass prophylaxis and treatment. *J. F. Corson*

BURKE, J. Compte-rendu de la chimioprophylaxie à la pentamidine dans la région du Kasai. (Sous-secteur du Bas-Kwilu, Foreami.) [**Chemoprophylaxis with Pentamidine in the Kasai Region of the Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1953, Feb. 28, v. 33, No. 1, 13–32, 13 charts & 1 map.

This region is in the western part of the Belgian Congo between the lower part of the R. Kwilu and the R. Kasai, a large tributary of the R. Congo. The work was done under the direction of FOREAMI as a trial of chemoprophylaxis in a region bordered by natural geographical obstacles to the spread of sleeping sickness and containing an endemic area surrounded by areas free or nearly free from infection. The population of the region lived in groups of villages which are referred to in detail. A thorough survey of the population was made a month before the time of the first injection in order to make all arrangements. At the time of the first injection persons found infected by examination of lymph glands, blood or cerebrospinal fluid were excluded, as were also women over 6 months pregnant. The dose injected was 5 mgm./kgm. in a 7·5 per cent. solution.

The first injection was given to 12,955 (92·2 per cent.) of a total of 14,051 Africans examined, among whom 60 new cases were found and treated curatively. Six months later, out of 14,045 people, among whom 6 new cases were found, 12,677 (90·2 per cent.) received an injection; of those who had already had their first injection, 11,826 were re-examined and 11,486 received their second injection, therefore only 84·05 per cent. of the whole population received 2 injections. Some intolerance of the drug was seen in 3·5 per 1,000 at the first injection and 1 per 1,000 at the second. A third examination, of 13,705 out of 14,502 people, was made after a further 6 months, and 2 cases of sleeping sickness, and 2 others diagnosed clinically, were found. In the course of the examinations all new cases found were in an advanced stage of the disease. A fourth examination will be made after another 6 months. [See this *Bulletin*, 1952, v. 49, 242, 245, 246.] *J. F. Corson*

DE SCHEITZ, L. & VAN HOYE, R. La pentamidinisation et ses résultats dans le territoire de Dungu. [**Prophylactic Use of Pentamidine in the Dungu Region, Belgian Congo**] *Ann. Soc. Belge de Méd. Trop.* 1953, Feb. 28, v. 33, No. 1, 33–9.

The Dungu territory is in the north-east part of the Belgian Congo on the borders of French Equatorial Africa and the Sudan. Sleeping sickness has

existed there for many years, but in 1949 a large focus was found and it was decided to use pentamidine prophylactically. Before giving the first injection to 19,318 Africans, 2 surveys were made and 726 new cases were found; when the second injection was given to 15,362 of these people 8 to 11 months later, no new cases were found, though there were 2 advanced cases, suspected at the preliminary surveys, and now confirmed. At the time of the second injections a further 5,511 people came for a first injection and among them there were 59 new cases.

Some signs of intolerance—vomiting, profuse sweating, lowered blood-pressure and slight faints—were observed at the first injection in about 10 per cent. of the people. The authors state that their excellent result was obtained because there were 2 preliminary surveys at an interval of 4 or 5 months, the examinations were made with great care under European supervision, in any doubtful case the patient was re-examined, and because a reward was given to the African staff for each case discovered [*trypanosome* should be *trypanosomé*?].

The intervals between the 2 injections were: 8 months (8,653 persons), 9 months (4,512), 10 months (351) and 11 months (1,846), no infected case being found: the authors plan to make the third injection after 9 months (1,000), 10 months (4,000), 11 months (10,000) and 12 months (4,000); they have already injected 7,000 of these and have noticed that slight toxic signs were more frequent than at the first 2 injections. They observed this also among treated cases and think that increased sensitivity to the drug had been acquired. The average prophylactic dose of pentamidine was about 4·5 mgm./kgm. but was reduced to 4 mgm./kgm. for the third injection; children weighing 5 kgm. or even less are given prophylactic doses, women in early pregnancy also, but aged people are excluded.

In a note on treatment of sleeping sickness with pentamidine the authors state that they now give the injections on alternate days instead of daily, and, preferably, preceded by an injection of caffeine or ephetonin [an isomer of ephedrine]; the patients bear the 10 injections very well. The period of observation after treatment is a year or 18 months so these patients also get a prophylactic dose to prevent reinfection. Patients who had not more than 10–15 cells per cmm. in the cerebrospinal fluid showed reduction, after 3 months, to less than 5 cells.

Stilbamidine was also tried prophylactically; a first injection was given to 690 people among whom were 18 new cases, and a second injection to 595, with no new cases, while at the same time another 103, with 5 new cases, received their first injection. This result is considered to equal that obtained with pentamidine. [See also this *Bulletin*, 1952, v. 49, 242, 245, 246].

J. F. Corson

LE GAC, P. & MULET, M. La trypanosomiase en Oubangui-Chari. Le foyer de Bimbo, sa prophylaxie par la lomidine. [**Trypanosomiasis in Oubangui-Chari; Prophylaxis with Lomidine in the Focus of Bimbo**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 1, 27–30.

The authors state that the 3 "bastions" of sleeping sickness in the Oubangui-Chari district of French Equatorial Africa were Nola, Bossangoa and Bimbo; Le Gac has described the "spectacular results" of the prophylactic use of pentamidine and lomidine [the dimethylsulphonate of pentamidine base] obtained in the 2 former areas (for Nola see this *Bulletin*, 1952, v. 49, 245] and in the present paper the results obtained in the Bimbo focus are given.

In November, 1950, among 7,765 persons examined, 966 new cases (12·6 per cent.) were found, the rate varying in the 10 Cantons of the area from 22·2 per cent. to 0·4 per cent.; in many families several members were found infected. All the people examined were given prophylactic doses of lomidine. A second survey in May, 1951, showed only 23 new cases among 9,567 persons examined, and in a third survey made 6 months later, only 10 new cases were found. The numbers of new cases (N.T.), and the indices of new cases (I.C.N.) and of "circulating virus" (I.V.C.) are tabulated:

	N.T.	I.C.N.	I.V.C.
1st Survey	966	12·6	12·5
2nd ,,	23	0·33	0·32
3rd ,,	10	0·11	0·1

The authors conclude that these results indicate almost complete extinction of the focus, and they think that chemoprophylaxis with pentamidine and lomidine is the best method for a focus of sleeping sickness whether in the forest (as at Bimbo) or in more open country. [See also this *Bulletin*, 1952, v. 49, 246.]

J. F. Corson

Hewitt, R. I., Wallace, W. S., Gumble, A. R., Gill, E. R. & Williams, J. H. **Experimental Chemotherapy of Trypanosomiasis. III. Effect of Achromycin against** *Trypanosoma equiperdum* **and** *Trypanosoma cruzi*. *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 254–66, 15 figs. on 5 pls. [15 refs.]

The substance named achromycin was obtained from *Streptomyces albo-niger* and has been used to treat mice and rabbits infected with *T. equiperdum*, against which many antibiotics have proved ineffective. It has also been tested against *T. cruzi* both *in vivo* and *in vitro*. A description of the new antibiotic has been given by Porter *et al.* (*Antibiotics & Chemotherapy*, 1952, v. 2, 409). The method of assay against *T. equiperdum* in mice has been previously described [this *Bulletin*, 1949, v. 46, 1128]. Single and multiple doses of drug were given by different routes. A chronic infection is produced in rabbits and death often occurs in 2 to 3 months after inoculation, with few trypanosomes in the blood. For *in vitro* assay of achromycin against *T. cruzi* a liquid medium maintained at 28° to 32°C. was used into which known numbers of trypanosomes were introduced and counts were made at various intervals.

The *in vivo* experiments with *T. cruzi* were made in mice. About 70 to 140 mgm. achromycin per kgm. given intraperitoneally twice daily for 7 doses (10–20 mgm./kgm. per dose) were required to cure mice regularly of *T. equiperdum* infections. The amount of antibiotic required for successful treatment increased as the interval after inoculation was longer, and dosage by month could prove effective. A total dosage of 140 to 280 mgm. per kgm. caused the lesions in rabbits to disappear without apparent relapse. The antibiotic may also be given to rabbits intramuscularly with success and it is apparently readily absorbed. At a dilution of 1/40,000 achromycin largely inhibited growth of *T. cruzi*, but subculture showed that live trypanosomes were invariably present. In infections of mice the results obtained were very variable, and the antibiotic appears to be ineffective against tissue stages of the parasite. Kidney damage has been observed after continued dosage of 25 to 100 mgm. per kgm. to rats during a period of 4 weeks.

J. D. Fulton

DIAS, E. Doença de Chagas nas Américas. IV—Colômbia. Venezuela e Guianas. [**Chagas's Disease in S. America. IV. In Colombia, Venezuela, British, Dutch and French Guianas**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, July, v. 4, No. 3, 255–80, 3 maps. [134 refs.] English summary.

This article will prove useful for reference and gives more information than the title would indicate. The author first gives detailed lists of the places in which various genera and species of Triatomidae are found in the countries mentioned, dealing in order with *Rhodnius prolixus, Triatoma maculata, Panstrongylus geniculatus, T. dimidiata, Rhodnius pictipes* and a dozen others. Of these, 10 have been found to be naturally infected with *Trypanosoma cruzi*, namely, *Rhodnius prolixus, R. pictipes, Triatoma maculata, T. dimidiata capitata, T. nigromaculata, Panstrongylus geniculatus, P. rufotuberculatus, Eratyrus cuspidatus, E. mucronatus* and *Psammolestes arthuri.* Another 8 (3 *Triatoma*, 2 *Rhodnius*, 2 *Panstrongylus* and *Belminus rugulosus*) have been reported in the region but not yet found infected in nature. Spot maps indicate the distribution of the bugs and the areas where human infection occurs.

Rhodnius prolixus is the chief vector of *T. cruzi* and human infection by *T. rangeli.* Of 11,651 examined, 6,547 (56·2 per cent.) were found to be infected. The next in importance is *Triatoma maculata*; of 1,203 examined 147 (12·2 per cent.) were infected. Then follows a list of 17 reservoir hosts of *T. cruzi*, including dogs, cats, armadillos, opossums and monkeys, and 6 species of bats, *viz.*, *Phyllostoma hastatum, P. elongatum, Hemiderma perspicillatum, Peropterix macrotis macrotis, Molossus obscurus* and *Artibeus jamaicensis lituratus*, which have been found infected by trypanosomes.

Among Venezuelans, 1,528 have been tested by xenodiagnostic methods and 565 (36·9 per cent.) proved positive; some of them were infected by *T. rangeli* [but what proportion is not stated, probably was not determined]. More than 700 human cases have been reported in Venezuela. TORREALBA has stated, and others endorse the statement, that Chagas's disease is the chief cause of myocarditis in the rural districts of Venezuela and he estimated that "two millions of Venezuelans live in hovels and at least one million suffer from Chagas's disease". *H. Harold Scott*

DA SILVA, T. L. & UNTI, O. Epidemiologia e profilaxia da Moléstia de Chagas no Estado de São Paulo. [**Epidemiology and Prophylaxis of Chagas's Disease in the State of São Paulo**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 83–90. [12 refs.] English summary.

Though infection by *T. cruzi* is known to be widespread throughout Brazil, and human cases, vectors and animal reservoir hosts are known to exist, studies on the actual prevalence in rural zones are few. In 1950 Pedreira de FREITAS reported of São Paulo that vectors were to be found in 130 municipalities and that infected Triatomidae were found in 72 of these and non-infected in the other 58; in 28 there were autochthonous cases and in 5 there were infected animals [see also this *Bulletin*, 1951, v. 48, 347, 455]. In 1951 the Malaria Prophylactic Service reported the presence of patients, vectors and animal hosts among the 369 municipalities of the State; Triatomidae were found in 229 of these and in 145 these insects were found infected; human cases were found in 74 and infected animals in 6. *Triatoma infestans* was found alone in 128 municipalities and with other Triatomidae (*T. sordida, P. megistus, Rhodnius* sp., etc.) in 71 others. In 143 of the 145

in which infected Triatomidae were found the insect was *T. infestans*; infected *T. sordida* in 17, *P. megistus* in 13; *T. infestans* is by far the chief vector. Among 19,545 Triatomidae captured, 19,139 (97·9 per cent.) were *T. infestans* and of 1,520 examined 1,517 (99·8 per cent.) were infected with *T. cruzi*, whereas of 376 *T. sordida* only 2 were found infected.

The food of the *T. infestans* was tested by precipitin reactions and was shown to be the blood of man, dog, cat and fowl. Of 631 examined 204 gave a positive for human blood (32·3 per cent.), 93 (14·7) for dog, 88 (13·9) for fowl and 27 (4·2) for cat.

For diagnosis of cases the Machado-Guerreiro reaction was the best. Of 3,709 samples tested 616 (16·6 per cent.) proved positive. For prophylaxis DDT was first tried but was found to have little effect on Triatomidae; BHC was better, especially if applied to both the inside and outside walls. One application a year is fairly effectual, but eradication will be obtained only if the spraying is done twice, or better thrice, in the year. The people generally are responding well to educational propaganda and teachers in the schools and municipal officers are giving much help. *H. Harold Scott*

Corrêa, R. R. & Aguiar, A. A. O teste de precipitina na identificação da fonte alimentar do *Triatoma infestans* (Hemiptera, Reduviidae). [**Precipitin Tests to determine the Origin of Stomach Contents in** *Triatoma infestans*] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 3–8. English summary.

In São Paulo the authors made precipitin tests on blood found in *T. infestans* caught in houses. They showed that it feeds chiefly on man, dog, chicken and cat; in 636 samples only 5 were negative for these animals.

Corrêa, R. R., Lima, F. O. & Carvalho, P. J. Da infecção natural pelo *Trypanosoma cruzi* das ninfas e adultos do *Triatoma infestans* (Hemiptera, Reduviidae). [**Natural Infection of Nymphs and Adults of** *T. infestans* **with** *Trypanosoma cruzi*] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 9–14, 8 figs. on 2 pls.

The English summary appended to the paper is as follows:—

"a) Nymphs and adults of *Triatoma infestans*, the main vector of Chagas' disease in the State of São Paulo, Brazil, were dissected. Nymphs in 3rd, 4th and 5th instars, and adult males and females were found naturally infected with *Trypanosoma cruzi*.

"b) Differences among nymphs of *T. infestans* in 1st, 2nd, 3rd, and 4th instars and nymphs of the species *Panstrongylus megistus*, *Triatoma sordida* and *Triatoma infestans* were established."

da Fonseca, J. A. B., Passalacqua, C. S. P., de Lima, A. R., De Oliveira, A. P. & Lacerda, J. H. de M. Índices de infecção de triatomíneos no Estado de São Paulo. [**Indices of Infection of Triatomids in the State of Sao Paulo**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 133–6. English summary.

Unti, O. & da Silva, T. L. Levantamento da Moléstia de Chagas no Estado de São Paulo pela reação sorológica. [**Incidence of Chagas's Disease in São Paulo as shown by Serum Reactions**] *Arquivos de Hig. e Saúde Pública.* S. Paulo. 1952, Mar., v. 17, No. 51, 123–32, 1 fig. & 1 map. English summary.

Fixation of complement, the Machado-Guerreiro reaction, is the surest test for Chagas's disease, especially the more chronic cases, a positive result

being obtained in more than 97 per cent. Xenodiagnosis is of immense value as a confirmatory test but it has its drawbacks and limitations, notably in that it entails the maintenance of colonies of Triatomas, the use of at least 5 for each suspect, delay for perhaps as long as 60 days for proof and, it might be added, the need for a specially equipped laboratory.

Complement-fixation tests have been carried out on 4,450 samples of blood from persons in 65 municipalities of the State; 713 of these (16·02 per cent.) were "unusable" or not fit for examination; of the remaining 3,737 sera, 636 (17·01 per cent. [not 20·02 as stated]) were positive; 1 to 4 plus (*i.e.*, partial to complete inhibition of haemolysis), 2,540 (67·96) were negative; 319 (8·5) were anticomplementary (*impediente*) and 242 (6·4) were doubtful. Excluding the last two, 636 were positive among 3,176, or 20·02 per cent.

The highest percentage of positives (62·5) was found in Taquarituba; in Pôrto Ferreira there were 71 positive (18·34), in Araçoiba da Serra 69 (12·43), in Timburi 57 (18·39), in Echaporâ 56 (17·61), in Itaporanga 51 (30·36) and in Garca 44 (26·51). The ages of the patients were noted in 569 persons from 36 municipalities giving positive reactions; for successive decades the figures were 144; 196; 79; 68; 43; 26; 11 were over 60 years of age and the ages of 2 were not known. Figures of the details of each of the municipalities are presented in a table, showing the positive, negative, doubtful, anticomplementary and spoiled samples with their respective percentages and the numbers of houses in which Triatomidae were captured.

The authors conclude that the Machado-Guerreiro reaction is specific for Chagas's disease, that it can be used safely for determining the range of infection by *T. cruzi*, that those reacting positively should be regarded as carriers of the infection, that all blood-donors should be examined for infection by this test, and, finally, that the test should be used for epidemiological surveys in Triatoma areas. *H. Harold Scott*

Dias, E. & Brant, T. C. Inquérito sôbre doença de Chagas realizado nas localidades de Pedra Branca e Sertãozinho, Município de Bambuí, Minas Gerais. [**Study of Chagas's Disease in Pedra Branca and Sertaozinho, Bambui, Minas Gerais**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, July, v. 4, No. 3, 227–30.

The English summary appended to the paper is as follows:—

"In two small localities of Bambui county, state of Minas Gerais, 5,692 *T. infestans* and 69 *P. megistus* were captured, 24·6 per cent of the former and 39·5 per cent of the latter infected with *S. cruzi*. In 27 mud houses sprayed only once with a mixture of Rhodiatox (4 per cent) and DDT (5 per cent), 2,431 triatomids were captured. The Guerreiro-Machado's reaction (*S. cruzi* antigen) performed in non-selected individuals disclosed the existence of the infection in more than two thirds of the population of the above referred localities. In 63 cases with positive reaction, the electrocardiogram disclosed the presence of anomalies in 31 (49·2 per cent). The most frequent alterations showed by the electrocardiogram were right bundle block (16 cases), auriculo-venticular block (9 cases) and venticular extrasystoles (7 cases)."

Coutinho, P. do P., Pínto, O. da S. & Barbosa, J. A. Contribuição ao conhecimento da distribuição dos triatomídeos domiciliários e de seus índices de infecção pelo *Schizotrypanum cruzi* no Estado do Rio Grande do Sul, Brasil. [**Distribution of Triatomid Bugs and their Infective Indices with *T. cruzi* in Rio Grande do Sul, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1952, July, v. 4, No. 3, 211–26, 2 folding maps.

The English summary appended to the paper is as follows:—

"The 78 counties surveyed in the state of Rio Grande do Sul include a total area of 235,216 square kilometers and a population of about 3,500,000 (1950 census). In this area, 6,244 triatomid bugs were captured from 1,229 houses of 108 localities, out of a total of 442 localities inspected in 51 counties. All bugs were of the species *T. infestans*, except one which belonged to the species *T. rubrovaria*. The feces of 5,995 adult and nymph bugs were examined including the *T. rubrovaria* specimen, 3,399 of which gave positive result for *S. cruzi*, thus showing an index of 56·69 per cent of natural infection. Out of the 51 counties found with triatomids, only 3 (Candelária, Caràzinho and Venâncio Ayres) did not present infected specimens. *T. infestans* is probably the sole vector of Chagas' disease in the state of Rio Grande do Sul, as it was the only domiciliary species found with a high index of natural infection in a very large surveyed area. In the present conditions of low economic and educational level of the population surveyed, the house spraying with an efficient insecticide seems to be the only feasible measure to control the spread of Chagas' disease."

Wigglesworth, V. B. **The Origin of Sensory Neurones in an Insect,** *Rhodnius prolixus* **(Hemiptera).** *Quart. J. Microscop. Sci.* 1953, Mar., v. 94, Pt. 1, 93–112, 16 figs. (2 on 2 pls.) [25 refs.]

LEISHMANIASIS

Petrishcheva, P. A. & Gubar', V. V. [**The Breeding of *Phlebotomus* in the Colonies of the Large Gerbil** (*Rhombomys opimus* **Licht.**)] *Ent. Obozr.* Moscow. 1949, v. 30, Nos. 3/4, 242–5. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, Feb., v. 41, Pt. 2, 19–20.]

Circumstantial evidence that the burrows of *Rhombomys opimus* are breeding places of sandflies (*Phlebotomus*) in the desert regions of the Soviet Union was confirmed in August and September, 1948, when 193 larvae, 106 pupae and 605 pupal skins of *Phlebotomus* were found in the substrata from a number of nests of this gerbil in south-western Turkmenistan. The 90 larvae and pupae taken in one of the nests gave rise to adults of *P. papatasi* (Scop.), *P. sergenti* Parr., *P. s. alexandri* Sint., and *P. dentatus* Sint. (*minutus* var. *arpaklensis* Perfil'ev), and adults from pupae taken in other nests also included *P. caucasicus* Marz. and *P. chinensis* Newst. Most of the larvae and pupae occurred at depths of 4–5 ft. None was taken in new colonies, with but scanty organic matter in the nests, or in

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PETRISHCHEVA, P. A. *et al.* [**Nests of Birds as Breeding Places of Sandflies** (*Phlebotomus*)] *Zool. Zh.* Moscow. 1949, v. 28, Pt. 3, 284–6. [In Russian.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1953, Feb., v. 41, Pt. 2, 19.]

Various species of birds burrow into soft soil on the sides of ravines, etc., in Central Asia to make their nests, the burrows being over 4 ft. long in some cases. Adult sandflies (*Phlebotomus*) become abundant in the burrows in May and June, but it was not known whether they bred in them. In the summer of 1948, substrata from 113 nests in south-western Turkmenistan were examined, and 8 mature larvae, 25 pupae and 136 pupal skins of *Phlebotomus* were found in eight of them. It is concluded that breeding occurs in the nests, but is only occasional, and that the adult sandflies use the burrows mainly as day-time shelters, especially in spring when the unfledged young in the nests serve as a source of food. Breeding takes place mainly in neighbouring burrows of the gerbil, *Rhombomys opimus*.

GUIMARÃES, F. N. Leishmaniose experimental. II—Comportamento da "Leishmania brasiliensis" Vianna, 1911 em Hamsters ("Cricetus [Mesocricetus] auratus" Waterhouse). [**Experimental Leishmaniasis. II. Behaviour of** *Leishmania brasiliensis* **Vianna, 1911 in Hamsters** (*Cricetus auratus* **Waterhouse**)] *Hospital.* Rio de Janeiro. 1951, July, v. 40, No. 1, 25–46, 14 figs. [17 refs.] English summary.

In order to verify previous observations on the production in hamsters of visceral infection with *Leishmania brasiliensis* [this *Bulletin*, 1948, v. 45, 508], the author carried out experiments with 5 more strains, 3 of which were isolated from muco-cutaneous lesions of cases of espundia. The material from human lesions was introduced into 61 hamsters: out of 41 inoculated intraperitoneally, 38 (92·7 per cent.) developed visceral infections, while out of 20 inoculated subcutaneously the viscera were involved in 19 (95 per cent.). Inoculation of leishmania cultures either failed to infect hamsters, or showed only slight visceral infection.

The infection produced in the hamsters depilation, cachexia, erythema and dermal exfoliation, conjunctivitis and tumefaction of the paws. Autopsy revealed ascites, splenomegaly and a yellowish liver. The organs and tissues affected were chiefly those rich in elements of the reticulo-endothelial system (spleen, liver, bone-marrow, lymph nodes), but parasites also attacked the skin, testes, intestine, lung, brain and muscles. The parasites occurred within macrophages, in both the tissues and the peritoneal fluid. They were sometimes also abundant in the skin.

The findings are illustrated by a number of photomicrographs.

C. A. Hoare

GUIMARÃES, F. N. V—Reprodução em camundongos (*Mus musculi*, var. *albina*) de uma leishmaniose cutânea nódulo-tumoral) (Histiocitoma leishmaniótico) ocorrendo na Amazônia. [**Experimental Leishmaniasis in Mice**] *Hospital.* Rio de Janeiro. 1951, Dec., v. 40, No. 6, 919–31, 11 figs. English summary.

In a previous paper [this *Bulletin*, 1952, v. 49, 1105] the author described a strain of *Leishmania brasiliensis* from Amazonia producing in human

a feature which distinguished this strain from other Brazilian strains [see above, 1953, p. 695]. On account of this peculiarity the Amazonian strain was regarded as a distinct variety of *L. brasiliensis*.

In the present paper an account is given of its behaviour in white mice. In all the mice inoculated subcutaneously there were local lesions at the site of injection, showing proliferation of histiocytes containing abundant parasites. But both among these mice and those inoculated intraperitoneally, parasitic invasion of the testes, vagina, heart and lymph nodes was also observed, with rare parasites in the liver and spleen, and none in other organs. The paper is illustrated by a number of photomicrographs.

C. A. Hoare

PELLEGRINO, J. Nota preliminar sôbre a reação intradérmica feita com a fração polissacarídea isolada de formas de cultura da *Leishmania brasiliensis* em casos de leishmaniose tegumentar americana. [**Preliminary Note on the Intradermal Reaction with the Polysaccharide Fraction isolated from Culture Forms of** *Leishmania brasiliensis* **in Cases of Muco-Cutaneous Leishmaniasis**] *Hospital.* Rio de Janeiro. 1951, June, v. 39, No. 6, 859–63, 1 fig. & 1 chart.

The English summary appended to the paper is as follows:—

"Adopting Fuller's method for isolating the polysaccharides of bacteria, the author extracted from culture forms of *L. brasiliensis* a polysaccharide fraction with which he carried out intradermic reactions in two cases of muco-cutaneous leishmaniasis. The intradermic reaction was also carried out with an antigen prepared by suspension of culture forms of *L. brasiliensis* in saline containing 'merthiolate' in the proportion of 1:5,000. The reaction was strongly positive in both patients and with both antigens. In 6 normal individuals the reaction was negative."

FEVERS OF THE TYPHUS GROUP

ORTIZ MARIOTTE, C. Campaña nacional contra el tifo en México. [**Typhus Campaign in Mexico**] *Bol. Oficina Sanitaria Panamericana.* 1953, Mar., v. 34, No. 3, 236–44, 4 figs. English summary.

Since 1944 efforts have been made to control louse-borne typhus in Mexico by disinfestation with DDT and the author claims that the diminished incidence of the disease has been due chiefly to this measure. The cases, per 100,000 of population in the 13 years 1939 to 1951 were—6·5; 6·9; 6·6; 13·5; 14·4; 9·9; 10·2; 9·2; 10·4; 9·0; 7·1; 4·8 and 4·8. The disease, however, was still important; 57 outbreaks in 12 areas were reported in 1951 when the Department of Health inaugurated a systematic campaign of mass-disinfestation with 10 per cent. DDT powder in localities in which the louse-infestation rate was found to exceed 30 per cent. When the rate was lower selective disinfestation was considered adequate. Young hospital nurses visited the homes, recorded the infestation rates, dusted the residents and paid second visits in which they found that the infestation rates had usually fallen to about one-third of those originally observed.

Reference is made to experiments in disinfestation by washing the clothing with soap containing 2–5 per cent. DDT. Good results were obtained with the 3½ and 5 per cent. soaps, but the method is still in the experimental

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stage and it is stated that the soap loses about 25 per cent. of its DDT content in a year. A pomade of vaseline containing 2 per cent. DDT was found very effective for hairy parts of the body; a single application was adequate. Arrangements are made for the supply of the insecticides at cost price and for the instruction of the people in their use.

John W. D. Megaw

CABRERA M., J. I., MCANALLY, W. J., JR. & MONTOYA, J. A. Informe sobre las actividades en el control del tifo en la República de Guatemala: 1946–1951. [**Report on Typhus Control Activities in Guatemala**] *Bol. Oficina Sanitaria Panamericana.* 1953, Mar., v. 34, No. 3, 225–35, 3 figs. English summary.

The authors describe the remarkable success of a campaign for the control of louse-borne typhus in Guatemala where the disease had been prevalent for many years in the highland regions at altitudes of 1,700 metres and over. The total population of the affected areas was about 1,200,000. Till 1946 control was by the methods in vogue before the introduction of DDT; the results were not satisfactory as is shown by the number of cases reported in the 3 years, 1943–1945; these were, 1,338; 2,144 and 2,834 respectively. The fatality rates in these years ranged from 11·4 to 17·8 per cent.

In 1946 the Government, with the collaboration of the Pan-American Sanitary Bureau, organized a campaign whose objectives were: (*a*) To vaccinate 70 per cent. of the people in the endemic zones with initial doses of 1·0 cc. of the modified Cox vaccine followed 3–4 months later by a second dose; "booster" doses were also given before each epidemic season. (*b*) All patients and contacts were dusted with 10 per cent. DDT powder. Opposition to these measures was overcome within 6 months, and from June, 1946, to December, 1951, the number of persons dusted was 194,771; more than 1,500,000 articles of clothing were dusted and nearly 2½ million doses of vaccine were administered. During the 6 years, 1946–1951 there was a progressive fall in the number of cases, the figures being 1,043; 251; 69; 26; 10 and 8. The corresponding figures for deaths were 135; 37; 9; 2; 2 and 0. In 1950 mass vaccination was replaced by selective vaccination, but disinfestation with DDT was continued. *John W. D. Megaw*

See also p. 771, JADIN and VERCAMMEN-GRANDJEAN, Les trombiculides larvaires du Ruanda-Urundi. [**Larval Trombiculidae in Ruanda-Urundi.**]

SILVA-GOYTIA, R. & ELIZONDO, A. Estudios sobre fiebre manchada en México. III.—Estudio por medio de fijación de complemento de sueros de ciertos animales domésticos de la Comarca Lagunera. [**Studies of Spotted Fever (Rocky Mountain Spotted Fever) in Mexico. The Complement-Fixation Test in the Study of Certain Domestic Animals of Comarca Lagunera**] *Medicina.* Mexico. 1953, Feb. 25, v. 33, No. 670, 76–83. [30 refs.] English summary.

Among domestic animals in contact with persons suffering from [Rocky Mountain] spotted fever the incidence of positive complement-fixation reactions was much higher than among animals in places free from infection. The percentages of reactions at titres of 1/8 or over are shown in the Table.

	Beef-Cattle	Cows	Donkeys	Goats	Dogs
Infected localities	73	40	38·8	20	11·1
Uninfected localities	-	4	2·9	-	1·2

None of the 23 cattle bred at the Veterinary Institute of Palo Alto gave a positive reaction.

The authors state that these findings indicate that the various animals are susceptible to the disease, which usually occurs in inapparent form, and that they support the hypothesis that ticks are the real reservoirs of infection, the animals playing a secondary part in maintaining the rickettsiae by acting as hosts of the vector ticks. Cattle, donkeys and goats are regarded as being more important than dogs in the epidemiology of the disease.

John W. D. Megaw

Berge, T. O. & Lennette, E. H. **World Distribution of Q Fever: Human, Animal and Arthropod Infection.** *Amer. J. Hyg.* 1953, Mar., v. 57, No. 2, 125–43, 1 fig. [183 refs.]

In this fully documented summary the history, distribution, and epidemiology, of Q fever are briefly described. There are 183 detailed references to the literature up to the year 1951. A small world map shows the geographical distribution of the disease as far as this has been reported up to the present time. A table gives references to the reported isolations of the infecting agent from man, ticks, wild rodents, cows, sheep and goats, naturally infected. The information supplied, especially that referring to the history of the discovery of the disease, is presented in a very convenient form and will be appreciated by students of the disease.

John W. D. Megaw

Bobo Morillo, T., Fiebre Q. [**Q Fever**] *Med. Colonial.* Madrid. 1953, Apr. 1, v. 21, No. 4, 384–401. [12 refs.]

A general account with reference to the literature.

Pérez Gallardo, F., Clavero, G. & Valle, E. Epidemiología de la fiebre " Q ". (Nota sobre la infección experimental del perro por la " C. burneti ".) [**Epidemiology of Q Fever. (A Note on the Experimental Infection of the Dog by** *Coxiella* [*Rickettsia*] *burneti*)] *Rev. Sanidad e Hig. Pública.* Madrid. 1952, Nov.–Dec., v. 26, Nos. 11/12, 641–4, 3 figs.

Three pairs of dogs, each consisting of an adult and a puppy, were inoculated with yolk-sac cultures of rickettsiae of Q fever. One pair was inoculated by the intraperitoneal route, another by the intracardiac, and the third by the subcutaneous route.

All the dogs developed a pronounced illness, with a moderate degree of fever which sometimes lasted as long as 3 weeks. Bloody diarrhoea was frequent; a dry cough, loss of appetite and weakness occurred in all the dogs, two of which died, one after intraperitoneal and the other after intracardiac inoculation. No obvious lesion was found on autopsy. The complement-fixation titres, which originally were negative, became positive at 1/2 to 1/80.

Attention is called to the need for investigation of the part played by dogs in natural transmission of the disease in view of the close association that exists between dogs, cattle and human beings, and of the frequent infestation of dogs with *Rhipicephalus sanguineus*.

[Derrick *et al.*, as long ago as 1938, reported that the dog was susceptible of inoculation with the disease and so have Blanc *et al.* in 1948, but further investigation of the subject is certainly desirable.]

John W. D. Megaw

Abinanti, F. R., Welsh, H. H., Lennette, E. H. & Brunetti, O. **Q Fever Studies. XVI. Some Aspects of the Experimental Infection induced in Sheep by the Intratracheal Route of Inoculation.** *Amer. J. Hyg.* 1953, Mar., v. 57, No. 2, 170–84, 4 figs. [12 refs.]

Six sheep were inoculated intratracheally by spraying a yolk-sac suspension of Q fever rickettsiae through a needle inserted between the 4th and 5th tracheal rings. None of the sheep showed any signs of illness, there was no rise of temperature such as occurred after intravenous inoculation of sheep by Lennette *et al.* [see this *Bulletin*, 1952, v. 49, 767]. One of the sheep died on the 23rd day of an intercurrent illness; no evidence of Q fever could be detected at autopsy.

Complement-fixing antibodies appeared in the surviving sheep between the 23rd and 31st days; the titres of the reactions were extremely varied, ranging from 1/8 to 1/256 and often showing capricious fluctuations. Agglutinating antibodies appeared earlier—on the 6th to the 11th day—except in one sheep which remained negative; these bodies also disappeared much earlier, sometimes within 3 weeks.

A fleeting rickettsaemia occurred in 4 of the sheep at some time during the first 9 days after inoculation, but never at a later stage. Rickettsiae were found in the faeces of 4 sheep before the 5th day, but never in later examinations up to the 49th day; it seemed possible that the organisms had been swallowed at the time of inoculation. During the period of observation of 49 days no rickettsiae were ever found in the urine or in oral, nasal and mammary-gland secretions.

Three of the sheep lambed during the next few weeks; the first birth was on the 53rd day after inoculation and 4 days later rickettsiae were recovered from the faeces, oral and nasal secretions of the dam and of another sheep; from the oral and nasal secretions of the lamb, and from the nasal secretions of 2 other sheep. By the 75th day no evidence remained of active infection of any of the animals and the parturition of a second sheep on the 70th day was not followed by a revival of rickettsial activity, but on the 87th day a sheep gave birth to a dead lamb and 5 days later rickettsiae could be recovered from one or more of the secretions or excretions of this and 3 other sheep and of the 2 living lambs. Within less than 2 weeks all evidence of active infection of these animals had again disappeared. In the first parturient sheep the complement-fixing and agglutinating antibodies had fallen to a low level a few days before lambing and then began to rise rapidly, reaching titres of 1/512 and 1/128 respectively. The third parturient sheep had a high complement-fixation titre throughout the period of observation and no further rise occurred at the time of lambing; the agglutinating antibody titre was 1/32 about 10 days before lambing; it rose to 1/128 just before lambing and after remaining at this level for 17 days it rapidly fell to 1/16. In the other parturient sheep lambing was not associated with any significant change in either antibody. The interpretation of the above findings was not clear and further studies are contemplated in which special attention will be paid to the possibility of a heavy contamination of the environment by infected placental material [this *Bulletin*, 1952, v. 49, 386], the attention of the authors not having been drawn to this factor before the completion of the present experiments. [A latent infection resulting from the inoculation and flaring up at the time of parturition through multiplication of the rickettsiae in the placental tissues seems to be a likely explanation of the findings.]

John W. D. Megaw

BERGE, T. O. & LENNETTE, E. H. **Q Fever. A Study of Serological Relationships among Strains of** *Coxiella burnetii* **(Derrick).** *Amer. J. Hyg.* 1953, Mar., v. 57, No. 2, 144–69, 9 figs. [25 refs.]

The authors describe a detailed and extensive study of the complement-fixing antigens of 11 strains of *Coxiella* [*Rickettsia*] *burneti* isolated from human, animal and arthropod hosts. The studies are of special interest to specialists in serology and the findings are recorded in 9 figures and 15 tables, from which a vast amount of information can be easily obtained but cannot be conveyed in a summary. To the general medical reader the chief interest of the investigation lies in the light thrown on the puzzling discrepancies that have often been observed between the complement-fixing and immunizing antigens of certain strains of the organisms. Two strains of antigens may show complete reciprocal cross immunity yet with the same serum one of them may give a high-titre reaction and the other a negative reaction.

In preliminary studies complement-fixation tests of sera of 8 Q fever patients, taken on the 13th to the 29th days, were made with 10 strains of antigens. With Henzerling antigen all the sera reacted at titres ranging from 1/64 to 1/1,024; 6 of the sera reacted also with the Dyer antigen at 1/16 to 1/64; only 2 sera reacted also with 3 antigens originating from infected sheep in California, at titres of 1/32 to 1/64, but none of the sera reacted with any of the other 5 antigens that were tested. In striking contrast to these results, the sera of 3 other patients tested 16–29 months after recovery from the disease gave remarkably uniform reactions with all the 10 antigens, at titres of 1/64 to 1/128, except that in 2 of the 30 individuals tests the titre was 1/32.

In the main series of tests 11 antigens were tested against the sera of guineapigs belonging to 11 groups, each of which had been immunized against a different antigen. With sera taken early in convalescence up to about 50 days after inoculation there were wide differences between the titres of the reactions with different antigens, whereas sera of the same animals taken several weeks or months later tended to give uniform reactions against all the antigens.

The existence of a high content of antigenic components common to all strains was indicated by the results of the complement-fixation tests and also by the results of absorption tests of the complement-fixing antibodies, but further study is needed of the failure of certain strains to fix complement with sera taken early in the course of infection even though they reacted strongly with the same sera taken two or more months after the onset of the infection, whereas other strains fixed complement with sera taken both early and late in the infection.

The Henzerling and Nine-Mile strains were consistently sensitive and reacted at high titres, early and late in convalescence, regardless of the strain of infection. *John W. D. Megaw*

BARTONELLOSIS

WIGAND, R. & WEYER, F. Neue Untersuchungen über *Bartonella bacilliformis*. 3. Mitteilung: Übertragungsversuche auf Rhesusaffen und auf Kleiderläuse. [**New Researches on** *Bartonella bacilliformis*] *Ztschr. f. Topenmed. u. Parasit.* Stuttgart. 1953, Mar., v. 4, No. 2, 243–54, 2 figs. [Numerous refs.]

So far as is known apes are the only experimental animals capable of being regularly infected by *Bartonella bacilliformis*; hence their use in diagnosis of Carrión's disease and identification of cultures. Of the apes the most suitable is the Rhesus. For their experiments the authors have used 3 strains of *Bartonella*; one from a patient with asymptomatic bartonellosis, one from an Oroya fever patient and one from Peru. Fourteen monkeys were used; some were inoculated intracutaneously, others intravenously. Either the pathogenicity of the strains varied or the animals showed a varying susceptibility, for the results were sometimes the production of verruga peruana, at other an asymptomatic bartonellosis and the organismal infection could in all cases be confirmed by culture, though it could not always be found in the peripheral blood. Splenectomy (which has been shown in rats as revealing a cryptic bartonellosis) did not affect the monkeys. In no instance were the symptoms of Oroya fever produced.

Body lice were also used for experiment. Intracoelomic injection had proved most serviceable for cultivation of rickettsia and equally good results were obtained with *Bartonella*, but rectal inoculation led only to a slight multiplication, and feeding of lice on an infected monkey was not followed by any increase of the *Bartonella* in the insect's stomach. *H. Harold Scott*

WIGAND, R. & PETERS, D. Blutparasiten der weissen Maus. II. Zur Kenntnis der *Bartonella muris musculi* Schilling. [**Blood Parasites of the White Mouse. II. Observations on** *Bartonella muris musculi*] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1952, Oct., v. 4, No. 1, 1–10, 11 figs. [18 refs.]

PETERS, D. & WIGAND, R. Zur Morphologie und Klassifizierung von *Eperythrozoon coccoides*. [**On the Morphology and Classification of** *Eperythrozoon coccoides*] Reprinted from *Ztschr. f. Naturforsch.* 1951, v. 6b, No. 6, 326–33, 13 figs. on 3 pls. [Refs. in footnotes.]

Mice are the natural hosts of *Eperythrozoon coccoides*, and the microorganism causes a latent infection which manifests itself overtly after splenectomy. In contrast to most of the *Bartonella*-like organisms *E. coccoides* is apparently completely non-pathogenic. It is related to *Bartonella muris*, from which it can, however, be differentiated by its characteristic appearance. In this paper the authors record their study of its morphology as revealed by phase-contrast, dark-field, and electron microscopy.

Unlike *B. muris* [WIGAND and PETERS, this *Bulletin*, 1951, v. 48, 141; 1953, v. 50, 105], which is always attached to erythrocytes, *E. coccoides* is found both on the cells and lying free in the plasma. In this investigation microscopical preparations of the organisms were made from both sites, and both wet and dry films were examined.

In dry unfixed films, either stained or unstained, most of the organisms are ring-shaped, with a clear central area and a darker periphery. The mean diameter of 200 rings was $0{\cdot}57 \pm 0{\cdot}1\ \mu$, and it is noted that there is no constant relationship between the diameter of the whole ring and the size of the clear area. Compact coccal-shaped individuals with a mean

diameter of 0·48 ± 0·08 μ were also present, but the relative proportions of the two forms varied widely in different preparations. In wet preparations, and in films which were fixed with formalin or OsO_4 before the cells were haemolysed, only the coccal forms were seen, and experiments showed that the ring forms were produced in unfixed material during the preliminary manipulations. In some instances oval or bizarre shapes were found in addition to the ring forms, and the protoplasm sometimes had a granular appearance due to denaturation of the protein.

As in the case of *B. muris*, no limiting membrane could be discerned, and the protoplasm showed no signs of differentiation. [The appearances described are illustrated by a series of photographs.]

In its morphology therefore *E. coccoides* is closely related to *B. muris* and other members of the *Bartonella* group, and the authors doubt whether a separate genus *Eperythrozoon* is justified. They state also that the absence of a limiting membrane and of differentiation of the protoplasm sharply separates the Family *Bartonellaceae* from both the *Rickettsiaceae* and the *Chlamydozoaceae*, all 3 of which are included in the Order *Rickettsiales* in Bergey's *Manual of Determinative Bacteriology*. The authors consider that *B. muris* and *E. coccoides*, and probably all the members of the 2 genera, should be excluded from the *Rickettsiales*. [*E. coccoides* is involved in the question of transmission of hepatitis in mice. See *Bulletin of Hygiene*, 1953, v. 28, 586.] *J. C. Broom*

DENGUE AND ALLIED FEVERS

HOTTA, S. **Therapeutic Experiments on Dengue Infection in Mice.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 1–8, 3 figs. [12 refs.]

An anti-dengue immune serum was prepared from rabbits by repeated inoculation with brain suspensions of infected mice. The serum was found capable of neutralizing "some of the virus *in vitro*" and it had a therapeutic effect on experimentally infected mice when administered intramuscularly in sufficient doses 24 hours after inoculation with the virus. A progressively diminishing effect occurred when administration was delayed till 2, 3, and 4 days after inoculation.

An attempt was made to prepare a therapeutic serum by inoculating a goat but the results were poor.

In experiments on chemotherapy of dengue, groups of infected mice were treated by 28 chemical compounds given at approximately the maximum tolerated doses and by the routes considered most suitable for the various substances. None of the treated mice survived, but with 4 of the drugs the survival period was lengthened on the average by about 25–45 per cent. The results, however, were variable and the author concludes that it is uncertain whether the prolongation of the survival period was caused specifically or not. The compounds concerned were 2 organic arsenicals, one sulphanilamide derivative, and 1 diphenyl ether compound.

Those interested will find full details of the experiments in the paper.

[References to previous studies of the dengue virus by the author have been made in this *Bulletin* [1952, v. 49, 687]. One of these references is

in a paper by SABIN who found that 3 strains of mouse-passage virus submitted by the author were "true dengue", whereas 2 other strains sent by other Japanese workers turned out to be Rift-Valley fever and fixed rabies virus respectively.] *John W. D. Megaw*

RABIES

REMLINGER, P. & BAILLY, J. La rabia y el tratamiento antirrábico en Tánger en 1952. [**Rabies and its Treatment in Tangier in 1952**] *Med. Colonial.* Madrid. 1953, Apr. 1, v. 21, No. 4, 354–61.

Comparing Morocco with other countries the authors note that, owing to compulsory vaccination of dogs rabies has disappeared from Hungary; in France vaccination is not compulsory but regulations are so strictly enforced that rabies has not been seen for some years, but in Morocco, though many of the dogs are vaccinated, other measures are defective and many cases occur each year. In 1951, 111 persons underwent treatment and in 1952 there were 83. Of these last, 46 were Mussulman, 23 were Spanish, 8 French, 5 Israelites and 1 Italian; 51 were males, 32 were females. Forty-eight were bitten on the hand or arm, 26 on the legs, 9 on the face. Fifty-five were bitten by dogs, 17 by cats, 9 by rats and one each by mouse and man [no further reference is made to the last]. In the Casablanca Pasteur Institute, 1713 persons received treatment in 1950 and 1845 in 1951 [the figure for 1952 is not given].

Stray dogs are caught and kept under observation and if not claimed in a week they are sent to the Institute and used for preparation of the vaccine. The vaccine used is a 5 per cent. emulsion of brain tissue in 1 per cent. phenol saline, attenuated by being kept at 37°C. for 24 hours and divided into 20cc. doses. Paralytic accidents were rare and the authors state that the risk has been greatly exaggerated. In 1951 and 1952 no true case was seen; one patient, a lad of 17 years, had a mild facial paralysis "of the type known as *a frigore*" which cleared up completely in a few days and was not allowed to interrupt treatment. Among dogs in 1952 the paralytic form was more common than *rabies furiosa* and this was observed in dogs with owners just as often as among stray dogs. Though rats abound in Tangier rabies conveyed by them is exceptional; in 1951 and 1952 there were 42 patients who had been bitten by cats [this presumably means rabid cats] and only 14 by rats.

During 1952, 7,286 animals had been vaccinated; 3,737 prophylactically (4 ampoules of 20cc. in 2 doses), 3,411 had an annual dose of 2 ampoules in a single injection; 84 by way of treatment (dosage varying with severity, number and sites of the bites); 13 cats were given preventive inoculation, 11 bovines and 8 equines curative doses [these total 7,264]. As cats are very susceptible to phenol they were given a smaller quantity and a more dilute emulsion, 8 ampoules of 10cc. containing 1 part of the ordinary emulsion to 3 of water. The 307 dogs sent to the institute in 1952 were not sufficient for the vaccine needed, so 41 goats were purchased and the vaccine was prepared by inoculating them suboccupitally; they died of paralytic rabies on the 7–8th days.

During the period when inoculation was started till January 1, 1953, 44,507 animals have received prophylactic inoculation, 44,287 of them dogs; 29,368 (29,336 dogs) a "boosting injection" (*una inoculación de conservación*) and 3,246 (1,757 of them dogs) injections for treatment of infection, a total of 77,121. No instance of paralytic accident has been reported.

H. Harold Scott

FREDRICKSON, L. E., WILLETT, J. C., SMITH, J. E. & PRICE, E. R. **Mass Immunization of Dogs against Rabies. Its Influence on a Rabies Epizootic in St. Louis.** *Amer. J. Pub. Health.* 1953, Apr., v. 43, No. 4, 399–404, 2 figs. [17 refs.]

The history of the incidence of rabies in St. Louis and the measures taken to deal with previous epizootics are outlined in this paper. A recent serious outbreak was dealt with very successfully by inoculating a high percentage of the dog population in a short and intensified campaign. *J. Carmichael*

CHOLERA

GALLUT, J. Sur le type *Hikojima* du vibrion cholérique. [**The Hikojima Type of** *V. cholerae*] *Ann. Inst. Pasteur.* 1953, Feb., v. 84, No. 2, 428–30.

The validity of the Hikojima form of *V. cholerae* was studied by serial single-cell culture, the point at issue being whether such strains are composed of a mixture of Ogawa and Inaba forms, with the former in greater proportion, or of regular elements with fixed proportions of the characteristic antigens. The Hikojima form is defined as possessing the common O antigen of *V. cholerae* along with the B and C antigens characteristic of the Ogawa and Inaba forms, the B antigen being in preponderance.

Two cholera strains and 2 El Tor strains of Hikojima type were used. Three of the strains after separation in single-cell form on three occasions from successive cultures gave growth of which the antigenic formula was identical with that of the original total culture. The fourth (cholera) strain at first separation gave a growth consisting of 17 per cent. Hikojima form and 83 per cent. Ogawa. A second separation from one of the Hikojima colonies of the first also gave a mixed growth, in this case 80 per cent. Hikojima and 20 per cent. Ogawa. A third separation gave a homogeneous Hikojima growth. Controls with Ogawa and Inaba strains showed the single-cell cultures to retain the antigenic characters of the original cultures.

It is concluded that the Hikojima form is stable and valid although there may sometimes be a tendency to change to the simpler Ogawa form. Reversion to the Hikojima form is, however, spontaneous and rapid. It is suggested that the partial change to the Ogawa form which was observed may have been due to antigenic impoverishment.

The author does not agree with Kauffmann's suggestion [this *Bulletin*, 1952, v. 49, 1114] that the Ogawa and Hikojima forms should be classified together with the antigenic formula AB(C). He did not find the C antigen present in any of his Ogawa strains even on incubation at 20°C. *J. Taylor*

GALLUT, J. Sur le pouvoir vibriocide du sérum de cobaye considéré comme révélateur du caractère "R" de *Vibrio cholerae*. [**The Vibriocidal Power of Guineapig Serum in the Recognition of the R Character of** *V. cholerae*] *Ann. Inst. Pasteur.* 1953, Feb., v. 84, No. 2, 363–9.

Reference is made to the finding of GURKIRPAL SINGH and AHUJA [this *Bulletin*, 1952, v. 49, 949] that colony characters and tests of stability may not be adequate for determining whether a culture of *V. cholerae* is free from

"rough" elements and suitable for use in vaccine manufacture. They had recognized the value of agglutination tests with a serum prepared against the rough-O form of the vibrio for detection of an apparent roughness and had also suggested the use of a new test based on the vibriocidal action of guinea-pig complement. This consisted in incubating the strain under test for 4 hours in contact with fresh guineapig serum and subsequently subculturing. SINGH and AHUJA had reported that smooth strains resisted the action of complement and that rough or partially rough strains were killed. The effect was not produced by all batches of complement, and for the purpose tested batches had to be used.

The author applied the test to a series of strains including some which he had reported to possess a multiplicity of antigenic factors in addition to those ordinarily recognized as characteristic of *V. cholerae*, a finding which Ahuja had suggested might be attributable to degeneration of the strains. The strains used were 12 agglutinable with anti-O cholera serum, of which 2 were rough and 1 partially rough. Of the 9 which were classically smooth 7 satisfied the test on all occasions. The remaining 2 strains did not always do so even with batches of complement which, from their action on other strains, were considered suitable. One of the strains which fully resisted the vibriocidal action of complement had been classified as "rough" by Singh and Ahuja by the same test. Another smooth strain gave a growth of both smooth and rough elements on subculture after the test. Of the strains classified as "rough" 1 resisted the action of complement on 6 out of 8 occasions and would have been classified as smooth on the basis of the tests of Singh and Ahuja. The other rough strain gave growth at all tests, this being of smooth colony character on 4 occasions and of mixed smooth and rough type on the other 4. A partially rough El Tor strain gave smooth growth when tested. A non-cholera strain was found to be fully resistant to the action of complement.

Some tests were also carried out by extending the period of contact with complement up to 24 hours. The results were very variable, smooth and rough strains both being killed by some batches of complement and surviving the action of others, sometimes with the appearance of rough colonies in the case of strains considered to be smooth. The action of complement appeared to be progressive. It is considered that fixing the time of contact at 4 hours is a somewhat artificial and arbitrary measure. The conclusion is drawn that the vibriocidal test will not serve to eliminate strains which are definitely rough. The appearance of rough colonies under the action of complement is considered to throw doubt on the basis of the test. *J. Taylor*

KOCH, W. & KAPLAN, Deborah. **Improved Media for** *Vibrio cholerae* **and** *Salmonella* **used in Human Vaccines.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 279–85. [10 refs.]

On the basis of the observation that glycerol in the presence of phosphate greatly enhances the growth of *V. cholerae*, media have been devised which will produce heavy growth of both *V. cholerae* and *salmonella* strains for use in manufacture of vaccines.

The medium eventually selected for *V. cholerae* was an agar medium at *p*H 7·6 to 7·8 with the following composition: peptone (Difco) 0·5 per cent., casein hydrolysate (Squibb) 0·5 per cent., NaCl 0·5 per cent., Na_2HPO_4 0·25 per cent., Bovril 0·15 per cent., Marmite 0·15 per cent., glycerol 2·2 per cent., agar 2·5 per cent. The yield on this medium was 12·6 times that obtained on a reference standard medium with the composition,

peptone (Difco) 1 per cent., NaCl 0·5 per cent., agar 2·5 per cent. The actual yield was 13·2 × 10^9 organisms per square centimetre with a standard inoculum, compared with 1·05 × 10^9 organisms in the control.

On corresponding lines various combinations were tried for *salmonella* strains. They were found to vary somewhat in their requirements for heaviest growth. Peptone was found to be superior to casein hydrolysate in its growth-promoting properties and for some strains the use of sodium glycerophosphate was advantageous.

Heaviest growth of *Salm. typhi* and *Salm. paratyphi B* was obtained on medium of the following composition: peptonum siccum (Armour) 1 per cent., NaCl 0·5 per cent., Na_2HPO_4 0·25 per cent., Bovril 0·15 per cent., Marmite 0·15 per cent., glycerol 2·2 per cent., agar 2·5 per cent.

The medium giving heaviest growth of *Salm. paratyphi A* and *Salm. paratyphi C* had the composition: peptonum siccum (Armour) 1 per cent., NaCl 0·5 per cent., Bovril 0·15 per cent., Marmite 0·15 per cent., glycerol 0·7 per cent., sodium glycerophosphate 3·0 per cent., agar 2·5 per cent.

On these media the yield was found to be between 5·6 and 7·4 times higher than that of a Bacto nutrient agar medium used as a control. [The authors have already described successful yields of *V. cholerae* on their medium in a previous paper: see this *Bulletin*, 1953, v. 50, 510.] *J. Taylor*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Weiser, J. Über Darmprotozoen der Bevölkerung Bosniens und Hercegovinas. [**Intestinal Protozoa in the Population of Bosnia and Herzegovina**] *Zent. f. Bakt.* I. Abt. Orig. 1953, Jan. 24, v. 159, No. 3, 231–4.

The author records the results of a survey of infections with intestinal protozoa among the inhabitants of Bosnia and Herzegovina (Yugoslavia), carried out in 1948–49. Out of a total of 2,000 stools, examined both directly and after centrifugation by Faust's method, 216 were found to harbour protozoa, which were distributed as follows: *Entamoeba histolytica* 6 cases, *E. coli* 153, *Iodamoeba bütschlii* 52, *Endolimax nana* 26, *Dientamoeba fragilis* 4, *Chilomastix mesnili* 9, *Giardia intestinalis* 18, *Trichomonas hominis* 2. It is noted that in all the cases of amoebiasis the infection was symptomless. The incidence observed by the author is compared with that recorded for the same region by Simić in 1939–40. *C. A. Hoare*

Ishii, N. & Iimura, M. **Observations on the Parasitological Findings and Transmitting Agents of Endemic Amebiasis.** *Yokohama Med. Bull.* 1952, Oct., v. 3, No. 5, 279–90, 2 figs.

Past investigations have shown that amoebiasis is more prevalent in rural areas of Japan than in urban areas. In Tokyo city its incidence was greater in 1946 than in 1936; this probably was equally the case in rural areas. The occurrence of intestinal protozoal infections in families and other groups in an urban and in a rural area has been re-examined, and the methods by which *Entamoeba histolytica* infection is spread are considered. It is thought that water and food are not important, but that contact with infected persons is the chief factor in its spread. It is suggested that after 40 years of age there develops some immunity to *Entamoeba histolytica* infection. *A. R. D. Adams*

LAVIER, G. Sur la pathogénicité de l'amibe dysentérique. [**The Pathogenicity of the Dysentery Amoeba**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 3/4, 45–7.

After a critical consideration of the data regarding the pathogenicity of *Entamoeba histolytica*, the author concludes that the degree of pathogenicity [or rather, virulence] of this amoeba is governed by two essential factors. One of these is the potential pathogenic power of unknown nature, which is determined by the genetic make-up of the parasite and varies from strain to strain. The other depends on the individual susceptibility of the host, and is influenced both by the local defence reactions of the intestinal wall, and by the general defence mechanism of the hostal organism. As regards the bacterial flora of the intestine, it may produce only a secondary complicating effect on the existing pathological state, but does not determine the latter. *C. A. Hoare*

KARLSSON, J. L., JAMES, M. B. & ANDERSON, H. H. **Studies on Nutritional Principles for *Endamoeba histolytica* in Autoclaved Bacterial Cells.** *Exper. Parasit.* New York. 1952, Nov., v. 1, No. 4, 347–52.

For the study of the effect of the constituents of bacterial cells upon the growth of *Entamoeba histolytica* in culture the authors used *Streptobacillus* sp. This bacterium was isolated from a mixed culture with the amoeba and grown in liver-protease-peptone medium with 1 per cent. glucose at 37°C. for 24 hours, after which the cultures were killed by boiling. In some experiments the bacterial cells were separated from the medium by centrifugation, and tested fresh or in powder form, after having been dried under vacuum. The tests were made in the original medium, in the supernatant fluid after centrifugation, or in Seitz filtrate of the culture. The test medium was poured out in 5 ml. amounts into test tubes, these were autoclaved, and then 10 mgm. of sterile starch, 1 ml. of 0·3 per cent. sodium thioglycollate, and 1 ml. of a culture of *E. histolytica* grown with organism *t*, were added to each tube. Finally, each tube received 2 ml. of a solution containing Difco yeast autolyzate, ammonium sulphate, sodium bicarbonate, bacitracin and aureomycin, the antibiotics serving to inhibit organism *t*. The tubes were then closed with a pyrogallol-carbonate anaerobic seal. The behaviour of the amoebae in the test and control cultures was compared after incubation at 37°C. for 48 hours.

It was shown that the pre-conditioned test medium promoted the growth and motility of the amoebae, whereas in the original medium they were scanty and motionless. When the bacterial cells were removed by centrifugation, growth of the amoebae was inhibited, but it could be restored by addition of centrifuged bacterial cells, indicating that the active growth factor is contained in the latter. In order to determine whether the growth factor was extractable, dried bacteria were treated with various solvents, after which the solution was evaporated and the solids re-dissolved in the culture medium, and tested for viability of the amoebae. The results were negative, indicating that the substance in question was available to the amoebae only in the intact bacterial cell. *C. A. Hoare*

KARLSSON, J. L. **Studies of the Physical Properties of a Growth Factor for *Endamoeba histolytica*.** *Amer. J. Trop. Med. & Hyg.* 1952, July, v. 1, No. 4, 548–51, 2 figs.

In another paper [see above] the author and his associates have described a growth factor for *Entamoeba histolytica* present in autoclaved bacterial

cells. The author has now purified the culture of the anaerobic *Streptobacillus* sp., which contains this factor, and has tested its properties on cultures of *E. histolytica* grown with the same bacterium, after the latter has been inhibited with penicillin and streptomycin. In the present experiments the test material consisted of *Streptobacillus* killed with 4 per cent. formaldehyde for 2 hours, and freed of this reagent by centrifugation and washing.

A study of the physical properties of the bacterial factor has shown that it is somewhat labile to heat, to alkali, and to oxidation, but stable in the presence of formaldehyde. It is thought that it may be a labile metabolic intermediate. That the stimulating effect upon the growth of the amoebae is due to the bacterial factor, and not to physical changes in the medium, is evident from the fact that the response of *E. histolytica* was proportional to the amount of dead bacterial cells added to the culture. *C. A. Hoare*

NAKAMURA, M., HRENOFF, A. K. & ANDERSON, H. H. **Drug Effects on the Metabolism of** *Endamoeba histolytica; in Vitro* **and** *in Vivo* **Tests of Synergism.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 206–11. [12 refs.]

The authors have obtained some data on acid and CO_2 production by *E. histolytica in vitro* by manometric methods and have at the same time studied inhibition of metabolic activity by certain agents in an attempt to find out the mode of action of these substances. Data on synergic activity between certain drugs has also been obtained by *in vitro* and *in vivo* experiment. The strain of *E. histolytica* used was accompanied by a single bacterial species.

After growth of the culture for 3 days at 37°C., 6 mgm. of penicillin G was added per tube and sealed with a plug soaked in alkaline pyrogallol to produce anaerobic conditions. Twenty-four hours later it was found that bacteria were inhibited while the amoebae were still multiplying. Amoebae were collected from a number of tube cultures by centrifuging and washing with saline 3 times in presence of cysteine. The final supernatant wash fluid was used as a control for bacterial activity. The amoebae were counted and a suspension was made so that 2 million or more were present in 1 ml. of saline. The amoebic suspension was used in Warburg manometers with bicarbonate present in a CO_2-N_2 atmosphere. Penicillin, streptomycin, cysteine and glucose were also added with amoebicidal drugs when they were being tested. After equilibration manometric readings were made at 10-minute intervals, for 70-minute periods. The total gas evolved represented the sum of acid plus CO_2 produced by the amoebae, the amount contributed by the bacteria alone being subtracted. The amount of inhibition of acid production in presence of the substances being tested was calculated.

The order of decreasing inhibitory activity was as follows: fumagillin, aureomycin, emetine, thiocarbarsone, and terramycin. Combinations of these drugs indicated synergic activity in particular with fumagillin and terramycin, and with the former and thiocarbarsone. Fumagillin appeared to act directly but at a slower rate than emetine. A drug which acted slowly would be at a disadvantage in this test. The influence exerted by the bacteria present cannot be accurately estimated. A synergic action was also observed between fumagillin and terramycin in monkeys naturally infected with *E. histolytica.* *J. D. Fulton*

BALAMUTH, W. **Comparative Action of Selected Amebicidal Agents and Antibiotics against Several Species of Human Intestinal Amebae.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 191–205, 3 figs. [29 refs.]

The author reviews the complexities inherent in any method of testing amoebicidal agents. When experiments are carried out *in vivo* either on man or animals different species of protozoa are encountered, as well as a host of bacterial types, in a medium whose composition varies widely. The author believes that the *in vitro* test may be of value but there is distinct lack of uniformity in the method of carrying it out, so that results from different laboratories often prove conflicting.

The object of the present study has been to obtain reliable data on the reaction of different species of amoebae to chemical agents and to gain some insight into the factors indispensable for a standard test. For this purpose the recognized amoebicidal agents used were emetine, vioform soluble, carbarsone oxide, and one of its dithio derivatives, as well as the antibiotics prodigiosin and aureomycin, and in addition a limited number of tests were carried out with terramycin and fumagillin on *E. histolytica* and *E. coli*. These substances were prepared in different solvents and adjusted to the required concentrations in the test medium.

Tests were made on 2 strains each of *Entamoeba coli*, *Dientamoeba fragilis*, and *Endolimax nana*, as well as on 2 cultures of *Entamoeba histolytica*, one of which was accompanied by a mixed bacterial flora and the other by a single bacterial species. The tests were made in 10 ml. volumes of the author's liver-egg-yolk infusion with material from 48-hour cultures, different amounts of inoculum being used to find how the end-points varied; the tests were verified by subculture where necessary. The effect of the amount of starch used in each culture was also studied. Aureomycin was tested under aerobic and anaerobic conditions, the latter being achieved by sealing the culture with paraffin. The condition of the bacterial population was also noted by studying the oxidation-reduction potentials of the cultures and by comparing the populations in treated and control tubes. Note was taken of the final *p*H of the test medium.

The conclusion of the author will be universally accepted that a standardized *in vitro* test is urgently required so that results from different laboratories may be compared. Variables involved include the inoculum, in which the component amoebae plus bacteria may vary widely in number and also in character. It is the general experience also that a mixed bacterial flora renders the amoeba less vulnerable to the action of a drug. As regards the medium, a well buffered monophasic type allowing good multiplication and growth and not interfering with drug action is desirable. With regard to end-points the author suggests that "an *amebicidal zone* might provide a more accurate picture than an arbitrary endpoint based upon a '100 per cent. kill'". Other results of the investigation showed that *E. histolytica* was about 25 times more susceptible to emetine than the other amoebae tested, and that those cultures in which a single bacterium was present were less resistant to drugs than others in which there was a mixed flora.

Prodigiosin, carbarsone oxide, and its dithio derivative exhibited the widest range of activity against all species. The statement by other authors that aureomycin had a notable direct amoebicidal action could not be confirmed. Fumagillin, in agreement with the findings of other authors, was found to be the most active substance *in vitro* so far tested. *J. D. Fulton*

McCowen, M. C., Callender, M. E., Lawlis, J. F., Jr. & Brandt, M. C. **The Effects of Erythromycin (Ilotycin, Lilly) against certain Parasitic Organisms.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 212–18.

A new antibiotic was described by McGuire *et al.* [*Bulletin of Hygiene*, 1952, v. 27 (1053)] named ilotycin (erythromycin), which they obtained from *Streptomyces erythreus*. It was of low toxicity and possessed activity against bacteria, typhus, rickettsiae, some viruses, helminths, and protozoa. It has now been tested against *E. histolytica*, *Treponema novyi*, *Toxoplasma*, oxyurids of mice, and also trypanosome infections.

The cultures of *E. histolytica* were tested in liquid medium in the presence of a mixed bacterial flora over a period of 48 hours at 37°C. The end-point was determined by microscopical examination aided by subculture. Comparisons of the activity of aureomycin and terramycin were made under similar conditions. Further tests were made in the absence of multiplying bacteria over a period of 72 hours. The results indicated that the new antibiotic was more active in the presence of multiplying bacteria, but otherwise had comparable activity to the other two substances. It was, however, somewhat more effective than the others in rats infected with *E. histolytica* on a dosage based on body weight.

Erythromycin, terramycin, and penicillin G were used in the treatment of *T. novyi* infections of mice by oral or intraperitoneal route. The new antibiotic and the two others proved effective when given by either route of administration. Two different natural oxyurid infections in mice, by *Syphacia obvelata* and *Aspiculuris tetraptera*, were treated by incorporating erythromycin in the diet, to the extent of 0·5, 0·25 and 0·125 per cent. The former infection was eradicated by the two highest doses and there was a significant reduction of the latter. When the antibiotic was given for 7 days in the diet mice were protected completely or in part against infection with *Toxoplasma*. Given orally to mice for 5 days in 40 mgm. doses it protected them against *T. equiperdum*, but not against *T. gambiense* or *T. cruzi*. Protection was not afforded by aureomycin or terramycin against any of these trypanosome infections. *J. D. Fulton*

Martin, G. A., Garfinkel, B. T., Brooke, M. M., Weinstein, P. P. & Frye, W. W. **Comparative Efficacy of Amebacides and Antibiotics in Acute Amebic Dysentery used Alone and in Combination in Five Hundred Thirty-Eight Cases.** *J. Amer. Med. Ass.* 1953, Mar. 28, v. 151, No. 13, 1055–9.

During 1951, at a prisoner-of-war camp in Korea, 644 patients were admitted to hospital suffering from acute attacks of amoebic dysentery; in 538 of these cases the condition was uncomplicated by other diseases. The diagnosis in all was based on a thorough physical examination including sigmoidoscopy, and microscopical examination of the stools with the recovery of vegetative *Entamoeba histolytica*.

In a table are set out the results, successful or otherwise, of the treatment of these patients with a range of the usual amoebicidal drugs, and with the antibiotics terramycin [oxytetracycline], aureomycin and chloramphenicol. Details of the methods of treatment with these various compounds are listed in another table. [These should be consulted in the original by those interested.]

All patients were under close observation in hospital for at least 6 weeks after beginning treatment; cure of the amoebic dysentery was claimed only

when there was cessation of the diarrhoea and other intestinal symptoms, freedom of the stools from parasites, and absence of any colitis as judged by sigmoidoscopic examination up to the end of the sixth week.

The general conclusions reached on analysis of the results are:—

1. Carbarsone, chiniofon, chloroquine and chloramphenicol when given alone are of only slight value in the treatment of acute amoebic dysentery.
2. Emetine and aureomycin when given alone, and milibis and chloroquine when given together, give a good immediate therapeutic response but usually fail to sterilize the infection.
3. Emetine, carbarsone and chiniofon when given together give a good immediate response and quite a good cure rate (19 of 23 patients so treated).
4. Terramycin, either alone or in combination with emetine, carbarsone, chiniofon, chloroquine and milibis [it is not clear in what combinations these were used], and also aureomycin with chloroquine give a very good immediate therapeutic response and the highest cure rates.

A. R. D. Adams

Dowdell, W. F., Roth, H. P. & Shumway, N. P. **Follow-Up Study of Clinical Results of Anti-Amebic Therapy.** *Amer. J. Med. Sci.* 1953, Mar., v. 225, No. 3, 245–52. [12 refs.]

An attempt is made to determine whether the wide variety of symptoms often ascribed to amoebiasis can be held to be due to the infection. Fifty-four patients with amoebiasis in the Clevelands Veterans Administration Hospital between 1947 and 1951 were studied to this end. The symptoms they complained of were very varied; 31 of the patients had primarily had diarrhoea and the remaining 23 had not; the patients in each of these 2 groups complained of various associated symptoms, which are listed. The technique of examination for amoebiasis included direct microscopical stool examinations, both with and without a saline purge, proctoscopy and swabbing, a complement-fixation test having as antigen an alcoholic extract of cultured amoebae, and a radiological examination after a barium enema. The drugs used in treatment included diodoquin [di-iodohydroxyquinoline], emetine injections, chloroquine, aureomycin, bacitracin, penicillin and retention enemata of carbarsone or of chiniofon. The period of follow-up study extended in some few cases to as much as 36 months.

Nearly all the patients admitted some relief of their symptoms immediately after specific anti-amoebic treatment; many of them said that subsequently the old symptoms recurred and some that further new symptoms developed, in spite of the fact that in all but 6 of the patients the parasitic infection had successfully been eradicated by the specific treatment. In 25 of the patients the presence of conditions other than amoebiasis was eventually found to account for the symptomatology. It therefore obviously is important to search for the true cause of persisting symptoms, and no further anti-amoebic treatment in the above circumstances should be given until it is clearly established that there is a persisting amoebic infection.

A. R. D. Adams

Fischl, M. [**Intoxications by Carbarson**] *Dapim Refuiim.* Tel-Aviv. 1952, Dec., v. 11, No. 4, [in Hebrew 262–8. (14 refs.) English summary I.]

In a series of some 8,300 patients receiving Carbarsone, the author, in Tel Aviv, found that 44 developed toxic symptoms. These mostly took the

form of painful gastric and hepatic disorders, but 8 patients developed severe encephalomyelitis and 4 of these died: at autopsy, haemorrhagic encephalitis was found.

The severe intoxications occurred with the use of doses much smaller than those usually given, and a fatal result was not prevented by the immediate withdrawal of the drug. However, BAL seemed to save those who were given it early enough.

The author does not agree with the view that Carbarsone is the "almost non-toxic one" of the organic arsenicals, and, from his experience, deprecates the use of "such a dangerous drug", which he considers was not justified either by the "certainty of the diagnosis nor the severity of the amebic disease". [In the author's short summary, evidence to show that the manifestations were due to Carbarsone is not given.]

H. J. O'D. Burke-Gaffney

ROCH, M. & LASSERRE, R. Lambliase et stéatorrhée. [**Giardiasis and Steatorrhoea**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1953, Nos. 11/12, 288–91.

The following is a translation of the author's summary:—

"A woman of 54 who had a gastric resection after having lived in Indo-China for 23 years, suffered from a foetid diarrhoea 6 months after her return to Europe, and this gradually developed into steatorrhoea. As there was a considerable infection with Giardia, mepacrine was given and this not only eliminated the parasites, but, at the same time, cured the steatorrhoea and its consequences." [See also this *Bulletin*, 1942, v. 39, 692.]

H. J. O'D. Burke-Gaffney

RELAPSING FEVER AND OTHER SPIROCHAETOSES

HOLMES, J. W. E. **Tick Control and Relapsing Fever.** *J. Roy. San. Inst.* 1953, May, v. 73, No. 3, 262–5.

Experimental work was commenced at Fort Jameson, Northern Rhodesia (14°S. 33°E.) in 1948 in order to find some simple and cheap method of controlling *Ornithodorus moubata*, the transmitting agent of relapsing fever. It was early confirmed that DDT was not effective; benzene hexachloride, on the other hand, is well known as a destroyer of ticks through cattle dip fluids. The experiments with BHC in houses gave rise to a general diminution in the tick population without achieving elimination; heavy spraying with 5 per cent. BHC solution was the method of application.

The spraying programme was considered to be unsatisfactory and BHC in powder form was tried. Eventually sawdust was adopted as a diluent; the most economical mixture that was found to give 100 per cent. kills was 5 per cent. BHC and 95 per cent. sawdust by weight. In practice the formulation of BHC used was a cattle-dip wettable powder of 40 per cent. BHC content; 1 quarter of a 25 lb. container, *i.e.*, 6¼ lb. of BHC wettable powder, was mixed with 50 lb. of sawdust, the usual content of 1 sack; efficient mixing, an unpleasant task, produces a 5 per cent. BHC-sawdust mixture.

The mixture is sprinkled at the base of all internal walls of the house, thus creating a barrier about 4 inches wide and of such a thickness that ticks must plough through it to pass from their normal resting places to their blood-meal objective at night. This barrier is maintained for 3 weeks and inspected daily to ensure that it is intact, particularly where it crosses a door opening.

The 3-week period includes the normal time taken from the laying of eggs to hatching; the nymph ticks are active blood suckers. Elimination is attained, but in practice reinfestation occurs after 12 to 18 months.

In addition, all the pests that normally inhabit the African hut are killed, including the flea, Congo-floor maggot and bed-bug.

The cost of dealing with African compounds within the Fort Jameson township, where the dwellings were of "Township grass" and notorious as centres of relapsing fever, was 11·2 pence per house, of which 6·4 was for materials and the balance for labour. Since 1950 few cases of relapsing fever have been traceable to these compounds.

By precept and example this method is being extended to African rural areas, the cost being borne by the African local authority; where sawdust is unobtainable, the chaff that remains from maize or mealies after pounding can be an effective substitute. *R. Ford Tredre*

YAWS AND OTHER TREPONEMATOSES

Anais da VI Reunião Anual dos Dermato-Sifilógrafos Brasileiros, Recife, 1949, Setembro. **Bouba; Disqueratoses; Piodermites.** [**Yaws, Dyskeratoses and Pyodermites**] 343 pp., numerous figs. 1952.

This well-produced volume from Brazil comprises 12 papers on yaws, 4 on dyskeratoses and 2 others.

Arnaldo Tavares discusses the epidemiology of yaws in Paraíba and stresses the high incidence of yaws in children under 15 years of age. Undernourishment is a major factor in predisposing to infection and facilitating dissemination in rural populations in uncultivated areas. Defective hygiene and occupations associated with repeated trauma are also important. The infants of a group of pregnant women with yaws, examined at 2–3 months after birth, were serologically negative and clinically free from yaws. The type of soil appeared to influence the incidence. In Paraíba yaws is rare on the cretaceous littoral soils and frequent on clay soils. Sixty-five per cent. of primary lesions were on the lower limb. The most frequent lesions were plantar and palmar keratodermias (41 per cent.), the former greatly predominating.

There is a paper on the history of yaws in Bahia and its distribution in that State. Olyntho Orsini discusses yaws in the State of Minas Gerais where he estimates there are 100,000 cases. Tropical ulcer, American cutaneous leishmaniasis and leprosy are also important diseases.

Professor Jorge Lobo and collaborators in a well-illustrated paper on the anatomo-clinical aspects of yaws classify the skin lesions as follows:—

- SKIN LESIONS OF YAWS
  - EARLY
    - macular
      - congestive (roseolar)
      - dyschromic
    - micropapular
      - follicular
      - miliary
      - lenticular
      - corymbiform
      - arciform
    - macropapular
      - framboesial
      - condylomatous
      - annular
      - palmo-plantar keratomata
  - LATE
    - keratodermias
      - cribriform
      - discoid
      - variegated
    - tuberous [gummatous]
    - tubero-ulcerative
    - ulcero-phagedaenic serpiginous
    - ulcero-phagedaenic perforating (gangosa)
    - nodular (nodules of Lutz-Jeanselme)

Later, Lobo and Glasner, in a paper on a histopathological study of the bone lesions of yaws classify them as follows:—

- BONE LESIONS OF YAWS
  - EARLY
    - osteo-periostitis
    - osteo-myelitis
  - LATE
    - frankly inflammatory
      - osteo-periostitis
      - osteo-myelitis
    - residual lesions with tendency to eburnation

The microscopical differentiation of yaws bone lesions from those of syphilis depends upon the absence in the former of endarteritis and gummatous lesions which occur in the latter. Goundou is regarded as definitely not a yaws lesion but is similar to leontiasis ossea; it occurs without yaws being present. A number of photomicrographs and radiographs illustrate this paper.

The late Professor Joaquim da Mota dealt with the palmo-plantar manifestations of yaws. In the early or secondary stage of yaws erythemata and papules may appear on the palms and soles but more frequent are the polypapillomatous lesions resembling those occurring elsewhere on the skin. Later in the secondary stage rounded desquamating papules may develop. A number of keratotic lesions may appear which may be confused with those occurring in the tertiary stage. Four different types of keratodermias are named, (1) punctate, (2) diffuse superficial desquamating, (3) diffuse with marked hyperkeratosis and linear fissures, and (4) circumscribed. The last are typically tertiary yaws lesions and occur in many forms.

There are papers on the achromatic lesions of yaws, and on the relation of yaws to pinta in which these two diseases are regarded as distinct entities caused by different species of treponemes. Treponemes are usually found in pinta lesions but are not found in dyschromic lesions occasionally seen in

yaws. Yaws and pinta can develop in the same person but yaws patients have some resistance to infection with pinta. Pinta occurs in an endemic zone in the State of Amazonas, but isolated cases occur elsewhere.

Dr. F. Nery GUIMARÃES writes about some considerations of the treatment and prophylaxis of yaws. He stresses that yaws is a serious disease despite misconceptions to the contrary and that its treatment deserves the same attention as that of syphilis. Although yaws can be cured by treatment under hospital conditions, prevention campaigns in the past have had little or no success. New cases occur in spite of apparent elimination of the source of infection. He considers the most important factor in this is relapse following inadequate treatment, and this is the cause of failure in many anti-yaws campaigns. That yaws may protect against syphilis does not justify abandoning attempts to control yaws. The serious reduction of productive capacity of an agricultural community in which yaws is prevalent further stresses the need to reduce and maintain it at a low residual level. In a campaign of which the author has been in charge for some time, " Agents " chosen from the local people search for and find cases by means of information and house-to-house visits. The patients are brought to a convenient centre and accommodated and fed while receiving treatment. Farmers and rural teachers give valuable assistance. The failure of past anti-yaws campaigns and the economic loss to the nation due to yaws indicate that campaigns cannot be regarded only from the point of view of immediate economic implications.

Papers on the histology of the lesions of late yaws, trauma and late yaws, and a study of nomenclature, " framboesia or bouba ", complete those concerned with yaws.

[This is a valuable collection of papers by some of the foremost Brazilian students of yaws. The value of many papers is greatly increased by good English summaries.] *C. J. Hackett*

DE NORONHA, C. As treponemoses no ultramar português. [**Treponematosis in Portuguese Territories Overseas**] *Rev. Portuguesa de Med. Militar.* Lisbon. 1953, v. 1, No. 1, 49–66. English summary.

This is a general review of the different treponematoses—syphilis, yaws, bejel and pinta—with many quotations from the literature [but no bibliography or list of references is given]. The use of arsenicals and of antibiotics, especially penicillin in syphilis, and the treatment of yaws, comprise almost the whole of this article. Yaws is rife in the territories concerned. Returns for 1951 gave 53,975 cases in Mozambique, 16,257 in Timor, 4,905 in Guinea, 4,352 in Angola; detailed figures from different " sanitary zones " making up these figures are given. Various schemes of arsenical treatment are mentioned as having been used in the past: sulpharsphenamine, novarsenobenzol, acetylarsen and the administration of these combined with bismuth, and the use of antibiotics, aureomycin, choramphenicol and terramycin in varied schemes of dosage. Stress is laid on prophylaxis which comprises 5 phases: 1. Preliminary investigation into the prevalence of the disease and the social and financial conditions of the people. 2. Choice of method. 3. Training and duties of personnel. 4. Arrangement for extensive treatment. 5. Rules and regulations. Each health unit should include a medical man specializing in the disease, a serologist, a nurse and a sanitary educational officer to instruct the mass population. *H. Harold Scott*

ROCK, R. E. **Yaws on Guam: Treatment and Environmental Considerations.** *Amer. J. Trop. Med. & Hyg.* 1953, Jan., v. 2, No. 1, 74–8.

"Yaws has been noted frequently in reports from Guam for the last fifty years" [no references are given]. During the recent war military occupation of the island resulted in mass treatment in some areas. In 1944–45 there were 2,246 patients treated for yaws, in 1946, 1,322, in 1947, 385, and in 1948, only 19. Treatment in 1945–46 was with mapharsen [oxophenarsine] 0·04 gm. weekly for 8 weeks. "Many adults were treated for their first infection and older children for relapses on reinfections associated with rapid spread among younger children.

"In February, 1949, children with infectious sores of yaws were found being treated for contagious impetigo." Investigation showed that yaws was present in areas beyond those dealt with in 1945–46. Four remote villages were studied. The author writes, "In the first school examined, that at village No. 2, the predominant relapse character of the lesions was easily apparent. The relapse ulcerations occurred with a violence not observed in Central and South America. The change from unbroken skin to serum-filled ulcers adjacent to old or fresh scars in younger children came with little or no proliferative phase. In addition, solitary granulomas were noted in older children whose scars and history would presuppose a stabilized infection and some degree of immunity after 3 to 5 years. These granulomas were common over the bony prominences of ankles, shins, knees, hips, elbows and shoulders. The granuloma quickly replaced the excoriation or abrasion of trauma and was more frequent in boys. In may instances such granulomas were followed within a short period by relapse ulcers elsewhere on the body." [Presumably this is intended to mean that destructive (tertiary) lesions occurred in young children and infectious skin lesions in older children.]

Many flies were seen feeding on "serum-filled ulcers" from which they could be driven only with difficulty. [Ulcers are characteristically late (tertiary) yaws lesions and contain few, if any, treponemes.] The most frequent flies were "of small size with a bluish hue". To reduce the flies a 7·5 per cent. solution of DDT in clear kerosene and 5 per cent. DDT solution in diesel oil were sprayed on to house surfaces once weekly for 4 weeks and "thereafter on four monthly occasions until interrupted by a typhoon". [No record is made of the dose per unit area.] Treatment consisted of 300,000 units procaine penicillin in 2 per cent. aluminium monostearate intramuscularly at 3–4-day intervals to a total of 1·2 mega units, and an equal number of injections of bismuth subsalicylate 0·2 gm. Half doses of both drugs were given to children less than 2 years of age. "Rapid epithelization occurred in the sores, but late type granulomas melted slowly."

A table shows that "The median age at onset was 7 years; that for active yaws 6 years and for inactive disease 10 years" for the total of 1,945 children examined [the table analyses the data for patients up to 20 years of age]. Of these 803 were "diagnosed as having active disease, 702 judged inactive and 440 without yaws". Follow-up observations were made at 5–8 months and again 9 months later. About 15 per cent. were not seen on these occasions. Most relapses occurred at 4–5 months after treatment and none after 7 months. The infectious relapse rate was 73 (9·5 per cent.) of 772 treated patients. Of the 279 late relapse cases 197 occurred in treated active infections and 46 in treated inactive infections.

"The lowest relapse rate five to eight months after treatment was found in the village having the best DDT control of its flies and the best trash clean-up; the worst rate occurred in the villages having poorest success with

its fly population." [So many variables were left active or not taken into account that these conclusions are probably unreliable.]

Scabies was found in 13 children. Infectious relapse of yaws occurred in 68 per cent of those developing chickenpox. ". . . 9 relapses were seen associated with ant bites. . . . Scratch excoriations, even more than in scabies, appeared to be the starting point."

[The terms, active, inactive, infectious and late, are not defined. Such terms as relapse ulcerations, serum-filled ulcers, solitary granulomas and late type granulomas should also be defined since they may confuse readers.]

C. J. Hackett

MARPLES, M. J. & BACON, D. F. **I. Observation on Yaws and certain Skin Diseases in Manono, Western Samoa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Mar., v. 47, No. 2, 141–7.

This paper records studies carried out during December, 1950, to February, 1951. Manono is a small volcanic island about 1 mile in diameter, with a population of about 1,000. There is considerable contact with Upolu about 2 miles distant. A clinical survey was made of 765 of the population. It was not found possible to distinguish secondary from tertiary yaws plantar and palmar lesions, and yaws lesions were therefore classified as infective and non-infective. Kahn tests on 30 Manono residents, over 5 years of age, who denied having had yaws, were strongly positive in 25. In a previous expedition to Western Samoa the sera from 95 per cent. of persons, with or without yaws, had positive Kahn reactions.

The following percentage incidences were found: skin clear 19, scabies 22, impetigo 32, infected cuts and boils 8, tinea versicolor 24 and other fungus infections 7. Clear skins, tinea versicolor and other fungus infections were more frequent after the age of 20 years than before. Over half the cases of impetigo were found in half of the 0–9 age-group and scabies occurred in a third of the same group. Impetigo often developed in scabies lesions in the earliest age-group before yaws reached its greatest incidence. It is suggested that the lesions of impetigo may form a portal of entry for *T. pertenue* carried by flies. Impetigo appeared to affect the general health of children and was most widespread in ill-nourished children.

Yaws. HARDING [this *Bulletin*, 1949, v. 46, 549] grouped all primary lesions, and all secondary lesions in which treponemes were likely to be found, as infective lesions. These were present in 13 per cent. of the persons surveyed; of children under 10 years of age 23 per cent. had these lesions, of those aged 10–19 17 per cent. and of those in each of the next 2 decades only 2 per cent., and none occurred thereafter. Difficulty was experienced in getting information about primary lesions. Only 13 primary lesions and 14 scars of primary lesions were recognized in Manono. These patients' ages ranged from 10 months to 8 years. Usually no reliable statements could be obtained about their past occurrence. In 44 patients 26 had primary lesions on the lower limb below the knee where impetigo most frequently occurred, 3 on the buttocks, 6 on arm or hand, 6 on face and 3 on trunk.

Generalized secondary yaws often occurred in children under 5 years of age and even in children under 2; the youngest patient was about a year old. Single granulomatous lesions occurred on the sole of the foot and elsewhere; 47 patients had plantar granulomata and in 25 of these they were the only skin lesions present; in the others non-infective dyskeratotic plantar lesions were also present; 30 were in the 0–9 and 17 in the 10–19 age-groups. In 19 patients non-infective plantar lesions accompanied

granulomatous lesions elsewhere on the body; all except one were under 20 years of age. Thus these non-infective lesions were probably all secondary lesions. No lesions of the mucous membranes themselves were observed. The high incidence of infective lesions (13 per cent.) may be due to the isolation of the island, which has no resident doctor, the high humidity and perhaps to the survey having been carried out in the wet season.

Non-infective lesions. These include all dry secondary lesions of the skin, ulcers, bone and joint lesions and all non-granulomatous lesions of the palms and soles; these were present in 18 per cent. of all persons, and the percentage incidences were 0–9 years 17, 10–19 years 28, 20–29 years 17, 30–39 years 13, 40–49 years 11, 50–59 years 14 and over 60 years 12. Nine patients with extensive tertiary ulceration were seen. Plantar lesions were most frequent in the 10–19 years age-groups but occurred in the oldest groups. Ulcers were not found in patients under 10 years, but 6 of the 9 were aged 10–19 years. Bone lesions and bone pain were not frequent in Manono; the former occurred in the older age-groups. Sabre tibiae were found in 24 patients, of whom 6 were under 10 years and 2 under 5 years of age. Disorganized or deformed joints were found in 8 patients but no dactylitis was seen. Radiographs were taken of disorganized joints and sabre tibiae.

Other yaws lesions. The pianides of MONTEL [this *Bulletin*, 1946, v. 43, 450] were described in 6 children under 5 years and in several older children. Juxta-articular nodules were seen in 6, enlarged bursae in 1, and dorsal ganglia in 3. Contractions of the fingers occurred in 10 of the older patients. The authors end their paper by saying " yaws is common in all parts of Samoa. It seems clear that despite all campaigns of treatment new cases of the disease are constantly appearing; treatment alone, at least with arsenicals, does not seem able to eradicate yaws ".

[The reviewer repeats his previous laments that there is insufficient knowledge as yet to allow the differentiation of secondary from tertiary lesions of the palms and soles. In mass campaigns it is of great importance that the potentially infective " non-infective " secondary lesions should be recognized with certainty.] *C. J. Hackett*

SATCHELL, G. H. & HARRISON, R. A. **II. Experimental Observations on the Possibility of Transmission of Yaws by Wound-Feeding Diptera, in Western Samoa.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Mar., v. 47, No. 2, 148–53.

This paper records observations made at the time of the summary reported by MARPLES and BACON in Part I [above, 1953, p. 717]. For the transmission of yaws by flies 4 conditions must be present: (1) suitable wound-feeding Diptera, (2) flies must pick up the treponemes from yaws lesions and retain them in a viable condition, (3) lesions with viable treponemes must be accessible, which requires an uninformed and indolent population, and (4) other lesions attractive and accessible to flies must be available to act as inoculation sites. It has been shown in Part I that in Manono the 3rd and 4th conditions are present.

Of 1,037 flies collected from small and rather trivial wounds, 52 per cent. were *Musca domestica vicina* and 47 per cent. were *Musca* (*Byomyia*) *sorbens*. The former was the predominant house-fly and the latter the out-of-doors one. Over 80 per cent. of specimens of both species were females. Wound-feeding fauna can be regarded as a selection of carrier fauna. *Hippelates pallipes* does not occur in Samoa. In Manono on bright

sunny mornings flies were extremely abundant on lesions which were often completely covered by them.

Collected flies were etherized, sorted and identified. They were kept in cages for at least 15 hours before use but had access to saline. They were fed on lesions from which treponeme-containing serum was exuding. Feeding lasted from ½ minute to 5 minutes. After varying periods of rest, the flies were again etherized, the proboscis was removed under a dissecting microscope and mounted in sterile saline; the crop and gut were removed and mounted separately, their contents being expelled by pressure. Slides were examined for 20 minutes. As only one dark-ground miscroscope was available, more crops than proboscides were examined. In 33 flies not fed as above no treponemes were seen; no treponemes which did not resemble *T. pertenue* were observed in any of the material examined during the study.

Muscid flies take their food into the crop during feeding, regurgitate it as vomit drops shortly afterwards and then take it back into the gut.

Motile treponemes were found in the crops of 32 (73 per cent.) of 44 *M. sorbens* up to 2 hours after feeding. Of 18 crops examined between 2 and 10 hours, in only 1 were motile treponemes found but in 3 others at 5, 5½ and 9 hours non-motile treponemes were found. [Table II does not agree with this.] The feed appeared to remain in the crop about 20–30 minutes and only small amounts of contents remained thereafter. Motile treponemes were found in the gut of *M. sorbens* in only 5 (12 per cent.) of 42 flies examined; in 21 others non-motile treponemes were present. Motile treponemes were found up to 1½ hours and non-motile up to 6 hours after feeding. Similar results were found in *M. domestica.*

Treponemes were found in the proboscides of 6 of 18 flies examined; all of these except one were removed from the fly within 4 minutes of feed. These treponemes probably came directly from the yaws lesion. Treponemes were found in 3 of the 5 moist vomit drops examined.

Another series of observations showed that under experimental conditions flies that had fed on yaws lesions may feed again on impetiginous lesions and *vice versa.* In the preceding paper (Part I) it was shown that 13 per cent. of the population of Manono had infectious yaws lesions, 32 per cent. had impetigo, 22 per cent. scabies and 8 per cent. infected cuts and boils. There are many opportunities for the transference of treponemes to skin lesions in family, village or community gatherings. It is thought that yaws infection of impetiginous lesions is probably important.

The authors do not think the vomit drop itself is important in possible transmission, but in wetting the labella the vomit drop may keep the labella infected for longer periods.

They discuss the work of Kumm *et al.* [this *Bulletin*, 1935, v. 32, 886; 1936, v. 33, 961] and Lamborn [*ibid.*, 1937, v. 34, 964] and conclude that all the conditions for fly transmission of yaws are present in Manono. Further evidence of the importance of this might be had by the application of residual insecticides in some villages and not in others and then comparing the incidence of yaws in relation to the density of the Muscid species. Such a study could be carried out in Samoa.

[This is a useful paper and was perhaps submitted for publication before the appearance of that by Barnard (this *Bulletin*, 1952, v. 49, 959).]

C. J. Hackett

Hasselmann, C. M. **Public Health Control of Syphilis and Yaws (Frambesia Tropica) with special reference to the International WHO/UNICEF Assisted Program in Indonesia.** *Amer. J. Syph.* 1953, Mar., v. 37, No. 2, 151–5.

VARELA, G., GONZALEZ RIVERA, M. & BARRIGA VAZQUEZ, F. Algunos datos epidemiológicos y estadísticos del "Mal del Pinto". Tabulación de datos tomados de 460 historias clínicas. [**Some Epidemiological Data on Pinta**] *Medicina.* Mexico. 1953, Feb. 25, v. 33, No. 670, 73–6.

The authors give data resulting from an epidemiological survey of 460 cases of pinta in a rural area in Mexico. The results are shown in 16 tables which include figures for sex, colour, age, occupation, economic status, educational level, nutritional state, previous attacks, years of exposure, overcrowding, presence of domestic animals, rodents and arthropods, cleanliness and washing facilities and use of latrines.

It is shown that while sex and age were not significant (except that few cases occurred under 4 years or above 60), there were only 20 cases (4·4 per cent.) in white people. Economic state, education and cleanliness were low, and overcrowding was very apparent. Surprisingly, only 8·7 per cent. were shown to be undernourished. Domestic animals, rodents and insects such as lice, bugs and fleas, were present in over 90 per cent. of cases. Only 12·9 per cent. had well water and 0·5 per cent. had latrines. Regular bathing facilities were present in only 8·1 per cent. Three-quarters of the people had never been to school and overcrowding in houses was prominent.

The authors point out the very great importance of personal hygiene in the prevention of pinta, and show that people living in good hygienic conditions generally escape it. They quote the case of a volunteer inoculated with the disease who developed an initial papule which disappeared after bathing with soap and water and without any other treatment. While personal contact seems to be the usual means of transmission, the authors do not exclude the possibility of transmission by insects. The need for pilot studies in selected areas, with laboratory control, is pointed out.

H. J. O'D. Burke-Gaffney

LEPROSY

LOWE, J. **The Nature of Maculo-Anaesthetic (Tuberculoid) Leprosy. The Role of the Tuberculoid Case in the Spread of Leprosy.** [Correspondence.] *Leprosy in India.* 1953, Jan., v. 25, No. 1, 46–9.

This letter is a vigorous criticism of articles written by KHANOLKAR and RAJALAKSHMI in the April, 1952, number of *Leprosy in India* [this *Bulletin*, 1952, v. 49, 1048]. The author first criticizes the claim to originality of these authors' views of the spread of infection up the peripheral nerves, views which have long been held by most leprologists. But he points out that leprosy dissemination through the nerves is only one of the routes by which bacilli reach the skin, and that especially in lepromatous cases bacilli are also spread through the blood and lymph vessels. But the strongest criticism is directed to Dr. Khanolkar's finding of bacilli in and on the skin of healthy contacts of both tuberculoid and lepromatous cases, and the interpretation of these findings. Many possible fallacies are connected with the ubiquitousness of acid-fast bacilli, such as their presence in tap water. "Dr. Khanolkar views all cases of leprosy as infectious and apparently infectious. On the latter point his findings are at variance with those of dozens of research workers of international reputation. . . . An isolated report such as that of Khanolkar does not carry conviction. It must be confirmed by others."

Ernest Muir

DHARMENDRA, CHATTERJI, S. N. & MUKERJEE, N. **A Study of the Flat Hypopigmented Patches in Leprosy with special reference to their Classification.** *Leprosy in India.* 1953, Jan., v. 25, No. 1, 4–28, 27 figs. (1 coloured) on 6 pls.

The chief difficulty in the classification of leprosy is in the interpretation of the indeterminate form of the disease, that is where there are white patches which have been white from the beginning, and are therefore not residual. In 128 of the 148 cases in Calcutta on which the study is based the investigations included bacteriological examination, the lepromin test done with the refined antigen and read after 24–48 hours, and histological examination. In the remaining 20 cases a histological examination was not made.

The conclusion reached is that if the lepromin test is positive and the bacteriological examination negative, a benign course may be safely forecast, and it is suggested that the case be classified under "non-lepromatous leprosy", with a sub-title of "macular variety" alongside that of "tuberculoid variety".

Likewise, if the bacteriological examination is positive and the lepromin test is negative, the disease almost always takes a malignant course, and it is suggested that it should be included as the "macular variety" under the lepromatous type.

Only the residue, that is cases with bacteriological findings and lepromin test both negative, or those with both positive, should be retained in the indeterminate group.

[This is a very thorough and detailed piece of work, and it should be read in the original by all interested in the diagnosis and classification of leprosy, as from its nature it is difficult to abstract adequately in the space available.] *Ernest Muir*

AZULAY, R. D., DE MOURA, A. & MOURÃO, G. A viragem da reação lepromínica pelo BCG administrado aos doentes lepromatosos em condições clínico-bacterioscópico-histopatológicas de "transferência para dispensário". [**Changing the Lepromin Reaction by the Administration of BCG to Lepromatous Patients who are in Condition Clinically, Bacteriologically and Histopathologically for "Transference to the Dispensary"**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 178–82. English summary.

Twenty lepromatous patients, in whom after sulphone treatment the lesions had retrogressed, who had been bacteriologically negative at 12 examinations, one each month for a year, and in whom the histological examination of the skin no longer showed lepromatous structure, were considered fit to be transferred to dispensary treatment. As their lepromin reaction was negative, they were given two doses orally at an interval of 15 days of 100 mgm. of BCG per dose. After a month and a half the lepromin test was repeated. In 16 the early reaction (after 24 hours) had become positive, and in 7 the delayed reaction (after 21 to 30 days) had become positive. The intensity of the early reaction was 1-plus in 5 cases, 2-plus in 6 cases, and 3-plus in 5 cases. The late reactions were all weakly positive. *Ernest Muir*

ROSEMBERG, J., SOUZA CAMPOS, N. & AUN, J. N. Reação de Mitsuda induzida por efeito de diversos esquemas de vacinação BCG oral e pela técnica de multipunturas de Rosenthal. [**Mitsuda's Test Conversion unchained by the Oral BCG Vaccination (Single or Several Doses) and by Rosenthal's Multiple Puncture Technique**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 183–96. [17 refs.] English summary.

One hundred and twenty-one children, who had been isolated from both leprosy and tuberculosis since birth, were all found tuberculin- and lepromin-negative. They were divided into 5 groups. A single dose of 0·10 gm. of BCG was given orally to 20 children; 2 doses of the same amount were given at an interval of a week to 20 others; and 3 doses of the same amount at weekly intervals were given to 30 others. Parenteral injections of a BCG suspension were given by multiple puncture on one occasion to 21 children. The remaining 30 were not vaccinated and remained as controls.

The lepromin test was done in all groups on the day of the beginning of vaccination. On the spot of lepromin inoculation there was a positive result in all the children of the vaccinated groups between the 15th and 65th days, except 1 in group 2 and 1 in group 4. All the control group remained continuously negative. Eight months after vaccination the lepromin was repeated, and this time only the 1 case in group 4 remained negative.

Among several important conclusions from this experiment is that the prophylactic routine of oral administration of BCG to new-borns, with the 0·10 gm. single dose of BCG, such as is being adopted in Brazil, besides its greater ease, is sufficient to convert the Mitsuda reaction with the same regularity as the multiple puncture technique. *Ernest Muir*

DORENLOT, H. Huit cas de réaction lèpreuse traités par l'ACTH. [**Eight Cases of Lepra Reaction Treated with ACTH**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 1, 56–65, 1 fig.

ACTH was used in 8 leprous patients in the phase of reaction. The daily dose varied from 25 to 60 mgm. and was given for 4 days. Reaction subsided much more rapidly than with any other method of treatment. But there were relapses after a number of days, a fact which has been noted by other workers. The author considers that ACTH is particularly valuable in dangerous reactions in the eye. *Ernest Muir*

PENNEK, J. La thérapeutique sulfonée à la léproserie de La Désirade (résultats d'ensemble). [**Sulphone Therapy in the Leprosarium of La Désirade, Leeward Islands (General Results)**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 1, 65–75.

This is a record of the treatment of 58 patients, 21 with Diasone, 12 with Cimédone (similar to Sulphetrone), 1 with Promin, and 24 with Disulone (DDS). During the course of treatment 33 patients had one or more attacks of lepra reaction. Signs of intolerance were to sulphones in general and not to any particular form of the drug. Thus there were 5 patients who had severe reactions whichever form of drug was used. The most marked improvements were in the lepromatous patients, especially in their general health and clinical appearance. There was not much improvement in polyneuritic conditions except in 6 out of 40 cases. In 6 there was aggravation of anaesthesia, but they were patients who were unable to take the treatment regularly. There was not much improvement in eye conditions except in 5, who gained improved vision. Taking everything into

account the author considers Disulone to be of recognizable practical superiority to the other 3 preparations, in being very active and better tolerated, and in offering the considerable advantage of cheapness. This is now the only form in use in his leprosarium. Details are given of several cases. *Ernest Muir*

GILBERT, D. J. **Notes on a Year of Treatment of Out-Patients with Diamino-Diphenyl-Sulphone with Special Mention of the Treatment of Eye-Complications in Out-Patients.** *Leprosy in India.* 1953, Jan., v. 25, No. 1, 29–31.

This is an account of out-patient treatment of leprosy by parenteral injection of a 20 per cent. suspension of DDS in coconut oil, the weekly dose being raised by 100 mgm. every month from 100 mgm. of DDS to 800 mgm. For patients living more than 20 miles distant a supply of DDS tablets is given which they can take daily, returning after a month. For the more intelligent patients the weekly total is increased during 6 months from 350 mgm. to 700 mgm., but with the less intelligent it is restricted to 350 mgm. There have been a few mild cases of reaction which have yielded to intravenous potassium antimony tartrate. Particular benefit has been obtained in cases of leprous iritis and subconjunctival leproma, and for this an intravenous proprietary sulphone is recommended so as to speed up the initial action of the drug. *Ernest Muir*

BERTI, F. A., ZITI, L. M., PEREGO, C., RZEPPA, H. W., RIECKMANN, B. H. G. & RAPP, O. P. **Chemotherapy of Leprosy. II—Compounds structurally related to 4,4'-Diaminodiphenylsulfone. Chemical Studies.** *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3–4, 197–208, 2 graphs. [21 refs.]

This is a slightly amended version of that already abstracted in this *Bulletin*, 1953. v. 50, 425.

MONTOYA, R. & PESCE, H. Psicosis sintomaticas por tratamiento sulfonico, en leprosos. [**Symptoms of Psychosis Caused by Sulphone Treatment in Leprosy**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 141–55. [17 refs.]

The authors, after recounting the history of sulphones, and mentioning the various preparations used, give details of 9 out of 377 patients treated by themselves in the *Colonia de San Pablo*, Loreto, Peru, in whom there were mental complications caused by sulphone treatment. The symptoms were the result of administration of DDS in doses of 300 mgm. daily by mouth [usually considered excessive]. The symptoms included macropsia, hallucinations, ideas of persecution and of catastrophe, dulling, depression, suicidal tendency, fugitive convulsions and irritability. Almost all the 9 patients showed symptoms of asthenia and anorexia from the beginning of the sulphone treatment, but they were free from other localized clinical organic complications. These mental complications, along with other general signs of intolerance, called for a smaller daily dose of DDS, a more gradual increase in dosage at the beginning of treatment, and the administration of vitamin B components when necessary. *Ernest Muir*

RISI, J. B., FONTE, J. & ROSSAS, T. P. Reajustamento do trabalho anti-leprótico às determinantes atuais. [**Readjustment of Anti-Leprosy Work to Present Conditions**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 156–77.

The present form of anti-leprosy work in Brazil, which is based on the harmonious functioning of leprosaria, dispensaries and preventoria, is

criticized as not having reached maturity. Statistics are given of the numbers per thousand of known leprosy cases in each of the 21 States of the Union in each of the 5 years from 1946 to 1950. These vary from 4·84 in Amazonas to 2·34 in São Paulo and as few as 0·09 in Alagoas in the year 1950, as compared with 3·65, 2·11 and 0·09 in these 3 States in 1946. The frequency per thousand of known cases in Brazil as a whole has risen during these five years from 0·96 to 1·17. In the new scheme suggested, importance is laid on 4 methods given in the following order of importance: early diagnosis, by examination of contacts of known cases; extensive treatment through medical assistants and others with suitable training for the purpose; education through social workers and others co-operating with the medical services; prevention of spreading infection by domiciliary isolation. There is also the possibility that BCG vaccination of leprominnegative cases may be of use in promoting immunity, and this might be used on a progressive scale. *Ernest Muir*

PLANET, N., OLIVEIRA, B. S., Jr., CARVALHO, C. M. & MAURI, A. C. O comportamento do "*Mycobacterium lepraemurium*" nos testes de redução do azul de metileno e do tetrazólio. [**Behaviour of** *Myco. lepraemurium* **in Methylene Blue Reduction and Tetrazolium Tests**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 209–13.

The English summary appended to the paper is as follows:—

"Using *M. lepraemurium* suspensions obtained from leproma of rats inoculated by subcutaneous route or from nodules of the peritoneal cavity, the authors have tested the capacity of these bacilli in reducing the methylene blue and formation of formazan from the tetrazolium.

"The time or intensity of reduction of methylene blue or formation of formazan are proportional to the concentration of bacilli in the suspensions and is increased with the storage in the refrigerator at 1°C.

"In comparison with tests performed upon other acid fast bacilli the ones with *M. lepraemurium* are developed very slowly."

PLANET, N., OLIVEIRA, B. S., Jr., CARVALHO, C. M. & MAURI, A. C. Verificação da ação bactericida do "Promin", "Sulphetrone" e sulfanilamida sôbre o "*Mycobacterium lepraemurium*" (aplicação do teste de redução do azul de metileno). [**Study of the Bactericidal Action of Promin, Sulphetrone and Sulphanilamide on** *Myco. lepraemurium*, **with the Methylene Blue Reduction Test**] *Rev. Brasileira Leprologia.* S. Paulo. 1952, Sept.–Dec., v. 20, Nos. 3/4, 214–17.

The English summary appended to the paper is as follows:—

"The authors have made bactericidal studies of drug solutions (*Promin*, *Sulphetrone* and sulfanilamide) at 40 miligrams per 100 ml. upon *M. lepraemurium* suspensions and using the method described in previous report, they tested the capacity of these bacillary suspensions in reducing the methylene blue.

"By these methods they failed to show any bactericidal activity of these drugs on the *M. lepraemurium.*"

GRUNBERG, E. & TITSWORTH, E. H. **Preliminary Note on the Effect of Isoniazid and Iproniazid in Murine Leprosy.** *Amer. Rev. Tuberculosis.* 1953, May, v. 67, No. 5, 674–5.

This short note gives another preliminary account on the use of isoniazid (and iproniazid) in experimental murine leprosy [this *Bulletin*, 1953, v. 50,

524]. White mice received intraperitoneally 0·5 cc. of the supernatant of a 10^{-1} diluted suspension of rat leproma and were treated immediately after infection and for 28 days altogether. The mice were given isoniazid in the diet in doses of 250 and of 500 mgm./kgm. per day: the same doses of iproniazid were given to other mice. Promin, 500 mgm./kgm./day given subcutaneously was used as a reference standard, and control mice were given either (1) the inoculum boiled for 5 minutes or (2) live bacteria.

All the mice were killed on the 29th day and the peritoneal lesions, crushed between slides, were examined for organisms and their numbers estimated. The symbol 3 was used to indicate innumerable organisms in each microscopic field, and it is emphasized that results based on the estimate of organisms in the lesions must be only approximate.

These result are shown in a table. Controls (1) and (2) showed 0·23 and 2·2 organisms respectively. In the case of promin, the figure was 1·05, which agrees with earlier published results, while in the case of isoniazid, 500 and 250 mgm./kgm., the figures were 0·86 and 0·57 respectively. The results with iproniazid were very similar. It is noted, however, that the lower dose appeared to be more active than the higher in each case.

It is concluded that isoniazid and iproniazid were found to exert a marked activity on *Myco. lepraemurium*, but that this seemed to be lower than that observed with *Myco. tuberculosis*. *H. J. O'D. Burke-Gaffney*

HELMINTHIASIS

Ricci, M. & Menna, F. Sull'azione dell'esilresorcinolo verso alcuni elminti intestinali. [**Action of Hexylresorcinol Against Intestinal Worms**] *Riv. di Parassit.* Rome. 1953, Jan., v. 14, No. 1, 23–8. [13 refs.]

The English summary appended to the paper is as follows:—

"Children between 19 months and 12 years of age, the most part affected by more than one helminthic disease, were treated with hexylresorcinol (Crystoids) per *os*. Ninety-three children had 1 dose of the drug, while 28 received 2 doses at an interval of 4 days. The results were the following. Negative results in 2 cases of *H. nana*; most striking results against *A. lumbricoides* (with one dose, 76·47% of cases recovered completely; with two doses, 90·91%); good results against *E. vermicularis* (with one dose, 50·82% of cases recovered; with two doses, 77·78%). As far as *T. trichiura*, it was observed that, following the administration of the drug, the number of eggs in the stools decreased markedly; one dose of the drug showed almost no therapeutical effect, two doses showed a mild effect. The administration of the drug showed no side effects."

Vermeil, C., Tournoux, P., Tocheport, G., Noger, C. & Schmitt, P. Premières données sur l'état actuel des bilharzioses au Fezzan (Lybie). [**Preliminary Note on the Incidence of Schistosomiasis in the Fezzan**] *Ann. Parasit. Humaine et Comparée.* 1952, v. 27, No. 5, 499–538, 8 maps & 5 diagrams. [26 refs.]

Following up the work of Nastasi [this *Bulletin*, 1939, v. 36, 618] the authors investigated the incidence of urinary schistosomiasis, in children only, in 5 regions of the Fezzan. Their results, together with those of

Nastasi, are presented in tables which also indicate the presence or absence of *Bulinus* in each locality, the type of water supply which was searched and the type of population. No evidence of infection with *S. mansoni* was obtained.

The species of aquatic molluscs and their localities as recorded by previous workers in this area are listed.

An attempt is made to compare the distribution of *Bulinus* with data on the hydro-geology of Fezzan, the results of a survey by a geologist, which are presented in a series of logarithmic diagrams. The authors' summary in French concludes with a passage which is freely translated as follows: The logarithmic diagrams expressing the quality of the waters in regard to the flora seem to us, by their ease of interpretation, to be suitable for the study of snail habitats. In particular, we were surprised to note the almost invariable disappearance of snail vectors where the Cl and Na ions attained a given level. These hydrogeological studies will perhaps make it possible to prove the essential rôle of certain chemical factors in the biology of the snails. *J. J. C. Buckley*

GREANY, W. H. **Schistosomiasis in the Gezira Irrigated Area of the Anglo-Egyptian Sudan. I.—Public Health and Field Aspects.** *Ann Trop. Med. & Parasit.* 1952, Nov., v. 46, No. 3, 250–67, 2 maps. [14 refs.]

The irrigation of the Gezira area which was begun in 1924 resulted in increased prosperity to the tenant farmers and a considerable increase in the population. Three years later *Bulinus* and *Planorbis* became established in the canal system but in 1940 the incidence of schistosomiasis was still apparently low and only *S. haematobium* had been observed. A survey carried out in 15 villages by STEPHENSON in 1942–45, however [this *Bulletin*, 1947, v. 44, 598], revealed *S. haematobium* in 21 per cent. of adults and 45 per cent. of children, and in 1944 130 cases of *S. mansoni* had been diagnosed in hospital.

The present survey was begun in 1946 and consisted of an investigation into the molluscan vectors with special reference to control, and into the incidence of the infection in the human population. In collections of snails, 4 potential vectors of schistosomes were found, *Bulinus truncatus*, *B. forskali*, *Physopsis africana* and *Planorbis biossyi* [*Biomphalaria alexandrina*]. *B. forskali* is rare in the area and thought to be of little importance. The other forms are common in the canals on vegetation, but only *Bulinus* was found in the Sennar reservoir. The importance of the association of weeds and snails in the canals is discussed and the possibility of snail control by means of weed control is indicated. Quantitative snail surveys revealed that every canal contained *Bulinus* and *Planorbis*, *Bulinus* being somewhat commoner at the south end of the canal system and *Planorbis* at the northern end. The even distribution of snails throughout canals is thought to be due to the plentiful food supply in the plant life which abounds there. During the dry season, April to July, when the canals may be dry for up to 3½ months, the snail survival in them was observed and it was found that a small proportion of both *Bulinus* and *Planorbis* were alive after 3½ months. During the period December to February young snails are most common in the canals, from which it is inferred that the maximum egg-laying occurs in the flood season. In aquarium jars, however, egg-laying was observed throughout the year.

Maximum and minimum air temperatures in summer and winter are given; maximum water temperature recorded in summer was 31·8°C. and in winter the lowest recorded was 12·7°C., at dawn. "So far as temperature

is concerned, therefore, schistosomiasis is transmissible at all seasons of the year."

Examination of snails, collected throughout the year from sites where they were most likely to have become infected, showed 0·06 per cent. of 5121 *Bulinus* and 1·2 per cent. of 6601 *Planorbis* to be infected with "schistosome-cersariae of the human type". Cercariae were being discharged from one or other type of snails at all seasons. "It can be seen . . . that persons using the canals for ablutions or drinking are constantly exposed to infection with *S. mansoni*, *S. haematobium*, or both, throughout the year." [The assumption that all mammalian schistosome cercariae from *Bulinus* and *Planorbis* are of human origin must be accepted with reserve. Those emerging from *Bulinus* could be from an animal source, *e.g.*, *S. bovis*; and as regards those from *Planorbis*, what evidence is there that the wild rodents in the Gezira area are not infected with *S. rodhaini*?]

Snail destruction in the area is carried out by means of copper sulphate, in the minor canals only; and the methods of application are the same as those used in Egypt. Analysis of mud from sulphated canals revealed 960 parts of copper per million in a canal which had been weeded and 450 p.p.m. in the unweeded one. The copper in the mud was insoluble and had no effect on snails when tested against them. Egg nests tested in canals undergoing sulphation were affected adversely in 7–11 days.

Of the population of the Gezira, totalling 310,000 persons, 81,027 were examined for *S. mansoni* and *S. haematobium* eggs in faeces and urine, and this revealed 8·77 and 8·86 per cent. respectively. The infection rates in children were 14·81 and 14·75 per cent. and in adults 4·79 and 5·37 per cent. respectively. In the analysis of infection rates in different age-groups significant differences were found, which showed that age affects the incidence. Analysis of sex incidence showed a higher rate in males with both infections. In both males and females the incidence of *S. haematobium* was higher than that of *S. mansoni*. The incidence of *S. mansoni* and *S. haematobium* was higher in immigrant men and women than in the local population. In the children, immigrants had a higher incidence of *S. haematobium* but between immigrant and local children the difference in *S. mansoni* infection was not significant.

"Data concerning the sites of different villages, the presence or absence of wells, and the annual closure of canals were collected and considered in relation with the incidence of infection among village children. A study of the data suggests that the only factor which appeared to influence singly the incidence of schistosomiasis in the child population was the distance of the village from a canal. In villages more than 1,000 metres from a canal high incidence-rates are less usual than in those nearer to the canals, and in these distant villages the presence of a well is associated with a lowered incidence.

"A study of the geographical distribution of *S. haematobium* and *S. mansoni* infections suggests that the differences of infections with the two species noted in the villages are due to the pattern set in those villages by the first human disseminators of the infections." *J. J. C. Buckley*

PITCHFORD, R. J. **Bilharzia and its Control in relation to Waters of the Northern and Eastern Transvaal Lowveld.** *Pub. Health.* Johannesburg. 1953, Apr., v. 17, No. 4, 339–41, 345.

In the lowveld of the Transvaal in the Union of South Africa the majority of farms worked by Europeans are situated along the banks of fairly large flowing rivers, and irrigation schemes, large and small, from these sources constitute a local feature; hence the farmer is not entirely dependent on

local rainfall for his crops. In the Reserve areas, on the other hand, the African has no irrigation system and depends on local rainfall, both directly on crops and indirectly to fill crude reservoirs, rivers or boreholes.

The incidence of urinary schistosomiasis in Africans is as high as 60–80 per cent. mainly because of (a) the attraction of children to bathing in any suitable water; (b) the universal presence of the correct snail intermediate host; (c) the normal desire for urination after contact with cold water.

The incidence of intestinal schistosomiasis among Africans resident in the compounds of European farms in parts of this area is also between 60 and 70 per cent. Latrines are rarely provided in these places and in consequence "the tremendous mass of filth" which accumulates in the vicinity of compounds through the dry season is washed by the subsequent rains into the nearest river or canal; if it is washed directly into a canal-dam system a high infectivity rate occurs in snails and a high infection rate in the Africans who bathe in the dams. On the farms where such bathing is prohibited the incidence of *S. mansoni* infection is low. In the Reserve areas, Africans are much more scattered, faecal deposits are washed mainly into rivers and flushed away and, with a smaller population of snails, fewer are infected. Incidence of the disease in the Reserve African is, in consequence, variable and lies between 7 and 35 per cent.

Mass or individual treatment is useless unless combined with an intensive programme of snail control. Briefly, this amounts to treating waters with copper sulphate. The selected waters are: (a) canal-pump-dam systems of the European farms; (b) small streams which usually teem with snails in the vicinity of human habitation; (c) the African Reserve areas, except the big rivers. Fish are not materially affected, unless they are very small. The European farmer can exclude further snail infestation of irrigation systems by sieves attached to pumps. Ducks are not voracious snail eaters and should receive little hand feeding if the snail population is to be decreased in this way.

The author is far from optimistic; progressive agricultural development creates demand for more water, which means more dams, canals and labour and more ideal habitats for snails. "With time will come a disease-ridden population unable to work the land they tilled a few years before."

R. Ford Tredre

Burnod, M. À propos d'un foyer isolé de bilharziose intestinale à Madagascar. [**An Isolated Focus of Intestinal Schistosomiasis in Madagascar**] *Bull. Soc. Path. Exot.* 1952, v. 45, No. 6, 744–6.

A new focus of intestinal schistosomiasis is recorded in Madagascar at Andriba in the north-west region, at a point equidistant from Mandritsara, Ankaratra and the east coast, and at an altitude of 850 metres. Faeces examination of 216 persons revealed 34 (15·7 per cent.) positive. Most of these were children having practically no clinical signs of infection but 8 persons showed massive splenomegaly. A search of the snail vectors in March–April, 1951, yielded none, but in October large specimens of *Biomphalaria* were found. This seasonal occurrence of the snails seemed to be correlated with a recrudescence of dysenteric symptoms in the people in November–December. The snail infection rate with "furcocercous cercariae of *Schistosoma mansoni*" [see reviewer's comment in abstract of article by Greany above, 1953, p. 726] was 7 per cent. at Andriba and 60 per cent. at Ampisavankaratra, a more heavily endemic spot 26 kilometres from Andriba.

The isolated occurrence of this focus is commented upon and its possible origins are discussed.

J. J. C. Buckley

DE AZEVEDO, J. F. O problema da bilharziose humana. [**The Problem of Human Schistosomiasis**] *Gaz. Méd. Portuguesa.* 1953, v. 6, No. 1, 167–86, 12 figs. English summary.

Schistosomiasis is one of the 3 main scourges of Africa, the other 2 being malaria and trypanosomiasis. *S. haematobium* is believed to be an important cause of abortion and sterility in women, and children become infected even when very young. Teachers in schools aver that they can tell when the older ones become infected by the falling off of the work and attention of the pupils.

After some general remarks on the subject, with references to the literature and previous reports, the author gives more details of the prevalence of the infection among the inhabitants of Mozambique. Examination of the urines of some 4,500 persons in Manhica, João Belo, Chibuto, Caniçado and neighbouring districts revealed infections ranging between 26 and 96 per cent., the lower figure among those using lake water whose margins are sandy and not very favourable for the snail hosts, the higher figure among those living in bad conditions and using ditch and canal water for all purposes.

It is calculated that each female *S. haematobium* expels some 238 ova daily. According to BARLOW's calculations here given, 238,000 ova eliminated in a day by an individual corresponds to 957 females, or 1,914 worms allowing one spouse per female. In 3 foci, Mariana, Chituto, and Xinavane there were found 37·8 per cent. among 66 persons examined [?25 persons], 30·6 per cent. of 62 [?19] and 42·5 per cent. of 40 [?17] respectively. The chief vectors are *Physopsis africana*, *P. globosa* and a *Bulinus*, perhaps *B. tropicus*, and another not yet identified; also *Planorbis pfeifferi* and another at present not identified. *Limnaea natalensis* is another possible host. *Pl. pfeifferi* prefers relatively clear running water in large canals as at Xinavane, while *Physopsis* is found in muddy or dirty canals or smaller collections of water. Owing to infection in early life and the persistence in adults the people are backward socially and economically.

The investigations were carried out by members of the Lorenço Marques Institute of Tropical Medicine. *H. Harold Scott*

ALVES, W. & CLARKE, V. DE V. **A Key to the Families of some African Gastropods.** *J. Trop. Med. & Hyg.* 1953, Apr., v. 56, No. 4, 84–9, 5 figs.

Thirty-nine families of African gastropod molluscs are included in this key, which also incorporates the genera (and related genera) of schistosome vectors in Africa. It is based on the structure and shape of the shells and involves the use of many anatomical terms unfamiliar to the non-specialist in conchology. These are clarified in a glossary of terms and by illustrations. The essential differences between the shells of *Physopsis* and *Bulinus* are indicated in two photographs.

"This Key has been constructed for use, in laboratories or in the field, by workers who are interested primarily in the molluscan hosts of the schistosomiases, but who have no expert knowledge of any snails."

J. J. C. Buckley

LURIE, H. I., DE MEILLON, B., STOFFBERG, N. & EISELEN, H. H. **Negative Cercarial Antigen Skin Tests in Proved Urinary Bilharziasis in Children.** *South African Med. J.* 1953, Apr. 11, v. 27, No. 15, 295–6.

The authors refer to the variable results obtained by different workers in the use of skin tests in schistosomiasis. They refer also to their previous

experience that reactions were often negative in children with ova in the urine [this *Bulletin*, 1951, v. 48, 901].

They have now studied the cercarial antigen skin test in 27 Bantu children in Johannesburg who had *S. haematobium* ova in the urine and positive complement-fixation tests.

A table shows that of 19 children aged 9–12 years, 1 gave a positive skin test, and of those aged 13–16, there were 2 positives out of 8. The same antigen gave positive results in all infected adults tested. The authors quote WRIGHT *et al.* [this *Bulletin*, 1947, v. 44, 833] who found positive skin tests commoner in chronic cases and FAUST *et al.* [*ibid.* 1946, v. 43, 756], who found these tests to be not very satisfactory in persons who had been exposed for brief periods and whose infection was less than 3 years in duration.

The present authors incline to the view that in their small series the low percentage of positive skin reactions was related more to the relatively short duration of infection in children compared with adults than to the actual age of the patients.

It is clear that a negative skin test does not exclude schistosomiasis, particularly in a child. *H. J. O'D. Burke-Gaffney*

GERRITSEN, T., WALKER, A. R. P., DE MEILLON, B. & YEO, R. M. **Long Term Investigation of Blood Loss and Egg Load in Urinary Schistosomiasis in the Adult African Bantu.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Mar., v. 47, No. 2, 134–40, 1 fig. [20 refs.]

As part of an enquiry into the rôle of parasitic infestations in aggravating malnutrition among the Bantu races in South Africa studies were made of the effect of *Schistosoma haematobium* infections in this connexion. No quantitative estimates of the blood loss resultant on schistosomal infections are available in the literature, and the present work is primarily intended to throw light on this matter. Eight adult Africans deriving from Portuguese E. Africa, Angola, and Nyasaland, all of whom were outwardly in good health, but had obvious haematuria due to severe schistosomal bladder lesions which were demonstrable cystoscopically, were selected for intensive study, in 6 cases for 10 days and in the remaining 2 cases for 19 days.

Specimens of urine were collected continuously throughout this time during 12-hour periods; the total iron content of each urine was determined by chemical estimations; from this the amount of blood passed in the urine was estimated from the formula:—

$$\text{blood loss per diem in ml.} = \frac{\text{mgm. iron loss per diem}}{\text{haemoglobin (gm. per cent.)}} \times 34$$

In addition the total number of eggs passed in the urine was determined and its colour was noted, the blood picture was examined, and the stools of each patient were examined for other helminthic parasites. The results are set out in two detailed tables.

The colour of the urine afforded little information as to the amount of blood lost in it. The average loss of blood per day, estimated by chemical means, was only 1·3 to 6·1 ml. in these 8 cases. The blood haemoglobin values ranged within the normal limits of 14 to 16 gm. per cent. in 6 patients, and were slightly subnormal in the remaining 2, who suffered also from malaria and from ankylostomiasis. The number of eggs voided in the urine varied rapidly and enormously in the same persons from time to time. It was consistent only in that it was high initially and then fell between the 3rd and 5th days of observation, to rise again thereafter in all cases. It is suspected that this occurred as the patients were first seen soon after an

exhausting journey lasting some days, and that the period of rest during the experiment ensured reduction in abdominal muscular activity during which further eggs collected, in vesiculae [see BARLOW, this *Bulletin*, 1949, v. 46, 752], subsequently to escape into the urine and be passed. It serves to emphasize the unreliability of the examination of single specimens of urine in the diagnosis of schistosomiasis. *A. R. D. Adams*

GELFAND, M. & HONEY, R. M. **Bilharzial Dilatation of the Ureter. A Report on Three Cases.** *South African Med. J.* 1953, Apr. 18, v. 27, No. 16, 326–9, 5 figs.

This is a description of 3 cases of *Schistosoma haematobium* infection, in males (1 European and 2 Africans) in Southern Rhodesia, in whom there was ureteral dilatation without any stricture of the affected ureters. In the first case there was dilatation of the lowermost parts of both ureters; in the second there was dilatation of the whole of the left ureter and early calyceal hydronephrosis; in the third there was dilatation of the upper and middle thirds of both ureters and marked bilateral hydronephrosis, and in this case the bladder was calcified and there was a demonstrable reflux from the bladder up the right ureter, but not the left. Through all the affected ureters could readily be passed a No. 9 Charrier ureteric bougie; this demonstrated the absence of stricture in them or their orifices.

The importance of these facts is that when hydro-ureter and hydronephrosis due to schistosomiasis are detected, ureterograms should be prepared and ureteric bougies should be passed before assuming that a stricture requiring routine dilatation is either present or causative. In these cases the factors responsible for the ureteric dilatation may be one or more of the following:—

(a) damage to the ureteric wall, and so interference with the normal propulsion of urine,
(b) a reduced bladder capacity,
(c) infection,
(d) a reflux of urine through an incompetent ureteric orifice.

[See this *Bulletin*, 1950, v. 47, 903.] *A. R. D. Adams*

BROOKS, C. P. **A Comparative Study of** *Schistosoma mansoni* **in** *Tropicorbis havanensis* **and** *Australorbis glabratus*. *J. Parasitology*. 1953, Apr., v. 39, No. 2, 159–65, 7 figs. on 2 pls.

"1. Miracidia of Puerto Rican *Schistosoma mansoni* penetrated *Tropicorbis havanensis* from Baton Rouge, Louisiana, as readily as they did the Puerto Rican *Australorbis glabratus*, the natural host.

"2. Larvae invaded the tissues of all exposed areas of *T. havanensis* and *A. glabratus*.

"3. Host-tissues response produced encapsulation of a great majority of the miracidia or sporocysts in *T. havanensis*. By examining snails sacrificed at appropriate intervals it was found that most of the parasites were destroyed between three and fifteen days after their entry into the host. Only a few survived beyond seven days. However, three to fifteen days after exposure of 38 *T. havanensis* each to 100 miracidia, 28 normally developing sporocysts were observed, one or more in each of 14 snails.

"4. Tissue response, regardless of the number of invading larvae, was not seen in *A. glabratus*.

"5. Although conclusions regarding the specific factors involved in the death of *S. mansoni* larva in *T. havanensis* cannot be made on the basis of present data, it is suggested that the occasional successful development of

sporocysts in this snail may be due more to intrinsic variation in the miracidia than to their chance location in exceptionally susceptible individual snails or in particularly favorable host tissues."

OLIVIER, L. & SCHNEIDERMANN, M. **Acquired Resistance to** *Schistosoma mansoni* **Infection in Laboratory Animals.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 298–306. [13 refs.]

"An attempt was made to demonstrate acquired resistance to *Schistosoma mansoni* infection in mice and hamsters. In one series of experiments, mice with light bisexual *S. mansoni* infections were challenged with an exposure great enough to kill uninfected mice. The survival pattern of the superinfected mice was significantly different from that of the controls in that the deaths were spread out over a much longer period. Apparently some of the mice were sufficiently immunized so that they were able to survive longer than the controls. In another set of experiments infected mice and hamsters were similarly challenged. Later, total worm counts were made and it was found that significantly fewer new worms developed in the superinfected animals than in the controls. These findings demonstrate that mice and hamsters develop resistance to reinfection to *S. mansoni*."

STANDEN, O. D. **Experimental Schistosomiasis. III. Chemotherapy and Mode of Drug Action.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 26–43, 3 figs. on pl. & 1 graph. [41 refs.]

A useful review is given of previous work on the chemotherapy of experimental schistosomiasis. The author's own experience is based on 12,000 animals treated while screening several hundred new compounds. He used an Egyptian strain of *S. mansoni* passed through *Australorbis glabratus*. Ova are obtained from the gut of killed hamsters, or the faeces of mice. Miracidia are obtained from these, and passed into snails and the resultant cercariae are used to infect mice. [For the technical details the original must be consulted.] Eight weeks after infection the mice are dosed once or twice daily, intraperitoneally or orally respectively, for 5 days, the maximum tolerated dose being given. Insoluble drugs are usually given intraperitoneally to avoid the possibility of rapid excretion *per anum*.

Until the 26th day almost all the worms of *S. mansoni* are found in the liver. About this time pairing takes place, and then the worms migrate to the mesenteric veins. The chief initiative and motile power for this comes from the male worm. The stimulus for the migration is derived from the act of mating. Egg-laying probably begins about the 34th day, and the eggs probably take 7–8 days to pass through the wall of the intestine into the faeces. To assess the effect of drug treatment, the author uses the technique introduced by SCHUBERT [this *Bulletin*, 1948, v. 45, 620] of recording the distribution of the worms in the mesenteric, portal, and hepatic veins respectively. Autopsy is made 7 days after the end of treatment, and attention is concentrated on the female worms. Drugs (*i.e.*, antimonials and miracil) cause first diminution of egg-laying; then there is loss of muscle tone and activity so that the worms are gradually swept by the blood stream back from the mesenteric veins towards the liver. Depigmentation, diminution in size, and other degenerative changes subsequently occur. The walls of the blood vessel become fibrosed around the worm, until eventually the worm dies and is invaded by leucocytes. While the worms are lying in the liver in semi-paralysed condition, they are particularly vulnerable to a further course of treatment. But after the 18th day following treatment

with miracil, a partial relapse may occur, and the worms are no longer susceptible to subcurative doses. After antimonials, the worms may recover in 7–11 days and they return to their normal positions in the wall of the intestine. In many cases the drugs are not sufficiently powerful to kill the worms directly; but the worms drift to the liver in a semi-paralysed condition, and (provided the action of the drug persists long enough) they are there trapped in the vessels by inflammation and fibrosis, and are so killed. It is often difficult to decide whether a degenerate worm is really dead or whether it would recover if it had been left in the body. In order to detect slight degrees of chemotherapeutic action (such as would guide the chemist in making further compounds) the criterion was taken of measuring the dose which resulted in at least 75 per cent. of the female worms being found in the liver at autopsy.

Apparently the female worm is killed by drugs more easily than the male, probably because of its less bulk and resultant smaller reserves. But unless schistosomes are kept by the drug in a semi-paralysed condition long enough for the tissue reaction to destroy them, they recover and return to the mesenteric vessels. In this way they differ from intestinal worms, which cannot return once they have been expelled *per anum*.

[This is a valuable paper on the chemotherapy of schistosomiasis and it should be consulted in the original by those interested.] *F. Hawking*

Hoffman, D. O. & Zakhary, R. **The Relationship of Exposure Time to the Molluscicidal Activity of Copper Sulfate.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 332–6, 1 fig. [12 refs.]

"In a study of the relationship between molluscicidal activity and exposure time, *Biomphalaria boissyi* were exposed to copper sulfate in pond water at 20°C. for various lengths of time. Expressed in terms of $CuSo_4 \cdot 5H_2O$, LD_{50} decreased from 55 p.p.m. following a 6–hour exposure period to 1·35 p.p.m. after an exposure of 72 hours. From a comparison of these data with the results of other workers it is concluded that the use of tap water in copper sulfate evaluation tests results in a considerably higher mortality than the use of natural waters from sites favorable for snail colonization. This effect is not due to the presence in natural water of factors which rapidly remove copper sulfate from solution.

"It is suggested that the use of low copper concentrations maintained for an extended period of time might be more effective and less expensive than the high concentrations which result when solid copper sulfate is dissolved directly in canal water."

Kisner, C. D., Stoffberg, N. & de Meillon, B. **Human Infection with** *Bilharzia bovis*. *South African Med. J.* 1953, May 2, v. 27, No. 18, 357–8, 2 figs. [19 refs.]

In the course of a survey of the northern watershed of the Witwatersrand already reported [this *Bulletin*, 1953, v. 50, 631] the authors found a few *S. bovis* in the urine of a European boy, aged 13. This case is now discussed in detail. The boy and his family were accustomed to visit the Hartebeespoort Dam at weekends and he and others swam and fished in the local rivers and streams, where many *Physopsis* infected with *S. bovis* had been found. He developed mild *haematuria*, but no other symptoms, and lesions were found in the bladder by cystoscopic examination: scanty ova were found in the lesions, which are described in detail and illustrated

in 2 drawings. The boy was treated with Nilodin, receiving a total of 5,400 mgm. in 6 days. Four days later, ova were absent from the urine and were not found again in 5 subsequent examinations during the next 3½ months. No ova were found in the stool and no other persons were affected. Six weeks after the course of treatment, the boy was well, free from haematuria and a previous eosinophilia of 23·5 per cent. had fallen to 8·0 per cent. a month later. Small pin-point tubercles were still present on the site of pre-existing polypi, but the bladder mucosa was otherwise normal.

The mean measurements of 6 ova were: length 225 μ, greatest width, 78 μ and width at 50 μ from the blunt end, 37 μ. According to the formula of ALVES [this *Bulletin*, 1950, v. 47, 375] these would agree with the criteria for *S. bovis* and not for *S. mattheei*.

Physopsis snails were exposed to miracidia from the eggs and cercariae were passed into mice, but only male worms developed. The authors discuss the literature [with which readers of this *Bulletin* will be familiar] on *S. bovis*, and the question of its capacity to infect man. In previously reported cases of urinary infection, it has been found together with *S. haematobium* or *S. mattheei*. They also discuss the views of other workers on the differentiation of *S. bovis* from *S. mattheei* [but quote incorrectly ALVES' statement (*loc. cit.*) that the chance of wrongly classifying *S. mattheei* as *S. bovis* is 1·5 per cent.].

The interest of the case lies in its occurrence in an area where snails are heavily infected with *S. bovis*, and where many of the inhabitants in the neighbourhood are exposed to infection, yet only one case of such infection has been reported: this confirms the rarity of *S. bovis* infection in man. This appears to be the first reported case in which pure *S. bovis* infection occurred in the urinary tract. *H. J. O'D. Burke-Gaffney*

LI, S. Y. **Studies on *Schistosomiasis japonica* in Formosa. III. The Bionomics of *Oncomelania formosana*, a Molluscan Intermediate Host of *Schistosoma japonicum*.** *Amer. J. Hyg.* 1953, Jan., v. 57, No. 1, 30–45, 7 figs. [12 refs.]

FU, H. H. & MA, K. C. **Chloroquin in the Treatment of Clonorchiasis sinensis.** *Chinese Med. J.* Peking. 1953, Mar.–Apr., v. 71, No. 2, 135–8.

"1. A case of chlonorchiasis sinensis was treated with chloroquin diphosphate which resulted in disappearance of ova from the stool and bile samples for three months after cessation of treatment.

"2. The stool became free from ova after a little more than 10 grams of the drug was given. Reappearance of the ova would probably be encountered if one stops the treatment at this dosage level.

"3. No untoward effects were encountered and no detectable abnormality in blood, urine and liver function test was found."

NEUHAUS, W. Über den chemischen Sinn der Miracidien von *Fasciola hepatica*. [**Chemical Aspects of the Miracidia of *Fasciola hepatica***] *Ztschr. f. Parasitenk.* 1953, v. 15, No. 6, 476–90, 1 fig.

JOHN, B. **The Behaviour of the Nucleus during Spermatogenesis in *Fasciola hepatica*.** *Quart. J. Microscop. Sci.* 1953, Mar., v. 94, Pt. 1, 41–55, 16 figs. (2 on 2 pls.) [25 refs.]

KUHLOW, F. Bau und Differentialdiagnose heimischer *Diphyllobothrium*-Plerocercoide. [**Morphology and Differentiation of Indigenous *Diphyllobothrium*-Plerocercoids**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Mar., v. 4, No. 2, 186–202, 9 figs. [14 refs.]

The English summary appended to the paper is as follows:—

"Plerocercoids of Diphyllobothrium were found in 6 fish species of the lower Elbe river (out of 16 species caught; total examined: 2,835 fishes). Larvae were raised in birds, mammals or humans to mature tapeworms and classified into species. *Gasterosteus aculeatus* contained plerocercoids of *Diphyllobothrium dendriticum* and *Diphyllobothrium vogeli*, the latter of which was also found in *Gasterosteus pungitius; Diphyllobothrium dendriticum* was found in *Trutta trutta*; *Diphyllobothrium osmeri* in *Osmerus eperlanus*; *Diphyllobothrium latum* in *Lota lota* and in *Perca fluviatilis*.

"Thus, for the first time, plerocercoids of Diphyllobothrium latum, a potential source of human broad tapeworm infection, were found in the Elbe river. It is supposed that they have been only recently introduced into north-western Germany.

"A morphological study of plerocercoids revealed peculiar and not yet described structural details which are missed in strobila stages, namely: cuticular bristles (in 3 of 4 species) and frontal glands (in all 4 species), the latter presumably playing a role in the migration of larvae from devoured to devouring fishes.

"Contrary to current opinion, obvious morphological distinctions could be demonstrated in the larval stages of the 4 mentioned species, distinctions which allow exact classification of fresh and preserved plerocercoids. Next to variance in shape, the development and arrangement of cuticular bristles, of cutaneous and parenchymatous muscles and of frontal glands are taxonomically important."

KUHLOW, F. Beiträge zur Entwicklung und Systematik heimischer *Diphyllobothrium*-Arten. [**Development and Systematics of Indigenous Types of *Diphyllobothrium***] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1953, Mar., v. 4, No. 2, 203–34, 12 figs. [32 refs.]

The following is the relevant part of the English summary appended to the paper:—

"Procercoids of Diphyllobothrium latum obtained from Sweden were raised in *Diaptomus vulgaris* and in *Cyclops strenuus*. Feeding of mature procercoids to *Anguilla anguilla*, *Tinca tinca*, *Gasterosteus aculeatus*, *Perca fluviatilis*, *Acerina cernua*, *Gasterosteus pungitius* led to the development of plerocercoids only in the 3 last-named fish species. These plerocercoids having been kept in the host fish for at least 70 days and at most for 7 months were fed to dogs and human volunteers, but without result. It is concluded that the development of *Diphyllobothrium latum* in the named fish is extremely slow. Plerocercoids of *Diphyllobothrium latum* from naturally infected Lota lota could be transmitted to frogs of the genus *Xenopus* by feeding, also by subcutaneous implantation and by intraperitoneal injection, remaining alive and infectious within the peritoneal cavity for several months, while plerocercoids of *Diphyllobothrium dendriticum*, *osmeri* and *vogeli* died rapidly under similar conditions.—Structural details of strobila allowing differentiation of diphyllobothrium species are pointed out. Also procercoid and plerocercoid stages can be classified according to structure, length of development and preference of hosts. Finally the taxonomy of avian diphyllobothria is discussed."

VON BONSDORFF, B. Perniciös maskanemi. [**The Pathogenesis of Pernicious Anaemia due to** *Diphyllobothrium latum*] *Nordisk Med.* 1953, May 1, v. 49, No. 18, 633–8, 9 figs. [23 refs.]

The English summary appended to the paper is as follows:—

"Von Bonsdorff describes his own and co-workers' extensive experimental investigations into the pathogenesis of pernicious tapeworm anaemia. On the basis of the results obtained, it is concluded that a constellation of the following factors is required for the occurrence of the disease:

"The living tapeworm (Diphyllobothrium latum) in the intestinal canal, competes with its host in absorbing vitamin B_{12} (and possibly some other haematopoietic substances).

"Deficiency of the substance (substances) mentioned may arise and cause pernicious anaemia in the host if the abode of the tapeworm is in the first part of the small intestine.

"Occurrence of pernicious tapeworm anaemia is promoted by deficient supply of extrinsic factor and/or decreased production of intrinsic factor.

"Needless to say, the constellation of the factors here described must cover a period of sufficient length."

ASHER, R. **Troublesome Tapeworms.** *Lancet.* 1953, May 23, 1019–21, 2 figs.

An account of 13 cases of *Toenia saginata* infection seen by the author in Britain in the last 10 years. The need is stressed for including the condition in the differential diagnosis of obscure abdominal pain.

OSIMANI, J. J., MIGLIARO, E. F. & ABELLA, C. M. Etude expérimentale de l'action des ultrasons sur la larve *d'Echinococcus granulosus* (kyste hydatique). [**Experimental Study of the Action of Supersonic Waves on the Larva of** *Echinococcus granulosus*] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, Nos. 1/2, 33–46, 6 figs. [24 refs.]

The authors' summary in French is translated freely as follows: The *in vitro* action of supersonic waves on the scolices and brood capsules of hydatid cysts of the pig were studied. Exposure to the treatment was for five minutes with an intensity of 2·5 w./cm.^{2} [watts per sq. cm.] and its effects were then estimated by microscopical examination and inoculation of white mice. The former revealed that the brood capsules may be ruptured and the mobility of the scolices is decreased; the margins become indistinct and the parenchyma more fragile. Nevertheless, in two exposures, no change was observed. In others the changes did not occur to the same degree in different hydatid elements. Inoculation of 12 mice (controls) with hydatid material resulted in the development of peritoneal echinococcosis in 10 (83·33 per cent.); the diameters of all the cysts recovered, when added together, gave a theoretical average of 11·48 mm. per animal. Of 14 mice inoculated with treated material only 35·71 per cent. became infected and the average diameter of the cysts was only 4 mm. Having analysed these results we consider that at least they justify the continuation of these attempts to study not only the prevention and cure of hydatidosis by the action of supersonic waves in experimental animals but also in certain aspects of the human disease. This will be our aim in future investigations.

J. J. C. Buckley

BEAVER, P. C. **Persistence of Hookworm Larvae in Soil.** *Amer. J. Trop. Med. & Hyg.* 1953, Jan., v. 2, No. 1, 102–8, 2 figs. [11 refs.]

"Eighteen enclosed units of soil were inoculated with equal numbers of hookworm eggs and dampened daily until larvae reached the infective stage. Half were then dampened daily and half left to dry until their turns came to be sampled. Sampling, which began on the 5th day in the wet series and on the 9th day in the dry, was progressive and cumulative, a new unit being added each day until all were under examination. Reduction in numbers in the wet series proved to be significantly more rapid than in the dry series, and on the five days when pairs of wet and dry cultures were sampled simultaneously, the dry cultures yielded 3 to 7 times as many larvae as the wet. When suspensions of infective larvae were poured onto damp soil, less than half of the larvae reached a depth sufficient to escape desiccation.

"The results substantiate the view that alternate wetting and drying of soil hastens the death of infective hookworm larvae. Thus, under usual conditions in well-drained sandy regions, infective larvae remain viable on the surface for only a few minutes after rain ceases and in the absence of added contamination the soil becomes practically noninfective after brief periods of frequent rainfall."

FERREIRA, F. S. DA C. & DE ALMEIDA, C. L. Contribuição para o estudo da ancilostomíase na Guiné Portuguesa. II. Aspectos clínico-terapêuticos. [**Ankylostomiasis in Portuguese Guinea. Clinical and Therapeutic Aspects**] *Gaz. Méd. Portuguesa.* 1953, v. 6, No. 1, 153–66, 4 graphs. [25 refs.] English summary.

Though this article contains no new information, it is of interest in analysing the details of 170 patients and applying the known facts to these in particular. The symptoms at the site of entry of the larvae, those caused by their passage through the lungs, attacks of coughing, dyspnoea, bronchitis, etc., and those due to the adult worms in the intestine are each detailed with graphic illustrations of the percentages in which they were found. Eighty-nine of the 170 (52·3 per cent.) were males, 81 (47·6) were females; 84 (49·4) were children, 33 (19·4) were adolescents and 53 (31·2) were adults. Twenty-one per cent. (36 patients) had malaria parasites in their blood, just over half had *P. falciparum*, one-fourth had *P. malariae* and just over one-fifth *P. vivax*. A few had helminthic infections other than hookworm; *Enterobius vermicularis* and *Trichuris trichiura* each 6, *Taenia saginata* 4, *Strongyloides stercoralis* 3, and *Schistosoma haematobium* 1.

As regards the grade of anaemia: 5 per cent. had between one million and 1,820,000 erythrocytes (average 1,470,000) per cmm. and haemoglobin from 16 to 40 per cent. (average 27); 14 had between 2 millions and 2,960,000 (av. 2,620,000) and Hb 22–85 per cent. (av. 53); 44 had between 3 million and 3,980,000 (av. 3,490,000) and Hb 50–90 (av. 65); 28 had between 4 million and 4,940,000 (av. 4,295,600) and Hb 60–96 (av. 72), and 9 had between 5 million and 5,870,000 (av. 5,380,000) red cells per cmm. and Hb 65–98 (av. 74) per cent. Thirty-nine of the patients presented no symptoms, subjective or objective, attributable to the infection; others suffered from palpitation, tachycardia, etc., according to the degree of anaemia, but the last did not run parallel with the degree of infection. Thus, those with red cells up to 1,820,000 per cmm. were passing on an average 2,630 ova per gm. of faeces (minimum 800, maximum 6,500); those

with corpuscles up to 2,960,000 an average of 790 ova (extremes 100 and 2,400); those up to 3,980,000 an average of 790 ova (extremes 100 and 4,800); those up to 4,940,000 an average of 940 (100–3,250) and those over 5 million an average of 786 (100–2,300). The eosinophilia varied between the normal 1–2 per cent. to as high as 34 per cent., the higher figures being found in the more recent infections.

The authors do not say much about treatment. The drugs used were carbon tetrachloride and tetrachlorethylene in doses of 2–3 cc. for adults; for children up to 15 years 0·15–0·2 cc. for each year of age. If no ova were found in the faeces after the first administration the patients were regarded as cured; if ova were present a second and even a third treatment was given after an interval of 2 weeks to a month. Only 62 treated patients are referred to; 31 were cured by the first treatment, 6 more by the second and another 7 by the third, together 44 out of the 62, recorded as 71 per cent.

H. Harold Scott

Diethelm, L. & Heuck, F. Der Wert des röntgenologischen Ascarisnachweises für die Diagnostik allergischer Darmerkrankungen. [**The Value of Radiological Investigation of Ascaris Infection in Allergic Disease of the Intestine**] *Med. Klin.* 1953, Apr. 17, v. 48, No. 16, 559–61, 1 fig. on pl. [17 refs.]

The male *Ascaris* is resistant to santonin treatment, but females, once subjected to this drug, do not produce eggs for 3–12 days. The absence of ova from the stools, therefore, does not necessarily indicate freedom from these helminths. To avoid error, therefore, radioscopic methods of demonstrating ascarids may be adopted.

The authors record 134 cases in which X-ray gave positive results, although ova were found in the stools in only 43. In the first 60 the concentration method of Telemann was employed, which is especially suitable for demonstration of infertile eggs. Afterwards Fülleborn's method was adopted. Four cases are described in detail in which worms were demonstrated in the mucosal folds. In some instances they were very small, difficult to detect, and sexually immature.

According to Vogel and Minning a period of 68 days elapses between infection and the appearance of eggs in the faeces. The authors claim to have seen in their series every grade from commonplace, symptomless infection to the most acute and rapidly fatal type, resembling an abdominal emergency.

On experimental evidence in animals injected with *Ascaris* extract they surmise that the acute manifestations are allergic in nature.

Philip Manson-Bahr

Beye, H. K., Kessel, J. F., Heuls, J., Thooris, G. & Bamdridge, B. Nouvelles recherches sur l'importance, les manifestations cliniques, et la lutte contre la filariose à Tahiti, Océanie française. [**New Studies on Filariasis and its Control in Tahiti**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 1, 144–63, 2 graphs.

In this paper the organization of the filariasis campaign in Tahiti is described and the paper covers much the same ground as the previous paper by some members of the present team [this *Bulletin*, 1953, v. 50, 47]. A great many of the statistics appear to have been compiled by Tahitian assistants.

The percentage of microfilaria "carriers" is about the same throughout the island and the authors have confirmed the main results of Galliard,

Mille and Robinson [*ibid.*, 1950, v. 47, 146] that it is higher in the foothills than down on the sea coast. The highest figures were obtained from the district of Tahiti known as Hitiaa (43·6 per cent.) and the Island of Bora Bora (44·4 per cent.), but in the Island of Maiao it was 27 per cent. No evidence of filariasis has been, however, found in the famous Pitcairn Island.

On the whole the density of microfilaraemia, computed from the number of microfilariae per 20 cmm. of blood was found to correspond with the proportion of people infected, thus conforming to the generally accepted rule.

Among 3,870 males microfilariae were present in 35·5 per cent.; in 3,494 females the figure was 30 per cent.; the densities of microfilaraemia were 90·1 and 53·6 respectively; figures which appear to contrast rather adversely with the results of the intradermal test which show no difference between the sexes. With regard to age the same rule held good, as elsewhere the gradually ascending rise of infection up to the 6th decade occurring in both sexes. Thus in males it was 11·4 in the first decade rising to 58·1 in the sixth: in females it was from 16·9 to 46·1 in the similar decades. [These results as plotted out in a graph (1) are somewhat confusing owing to faulty proof-reading.] The figures suggest that, at the age of 35 saturation point had been attained. It is surprising that up to the age of 10 density of infection is somewhat higher in females than in the males.

The results of physical examination invariably showed that the majority of the males above the age of 50 presented the most marked clinical signs of filarial disease, while a smaller proportion of women were affected—a fact which is probably connected with their respective physical environment and exposure to the bites of infected mosquitoes.

Taking it as a whole, 34 per cent. of Tahitians were found to be infected; 17·4 per cent. of Chinese, and 15 per cent. of the 105 Europeans and Americans examined.

The liability to attacks of lymphangitis increased with age, and parallel with the development of signs of the elephantoid state. The intradermal test (with *Dirofilaria immitis* antigen), 0·01 cc. of a 1:8,000 solution in the forearm, with results read after some 20 minutes, gave a percentage of positives from 31 in the first year of life to 87 per cent. in the 12-year-old group and over. No mention is made of any control observations in negative persons.

Altogether 336 persons with elephantiasis were examined. The rate rose from 1·5 per cent. of the population in the district of Pirae to 9·9 per cent. in Hitiaa, an area with the greatest proportion of microfilaria carriers. Of these, 27 per cent. had microfilariae in the blood. The liability to elephantiasis increased with age. One in every 3 Tahitians above 50 was affected; more men than women. The lower limbs were more frequently swollen than the upper extremities.

The effects of Notézine (hetrazan) were studied in the following manner:

(a) A single course of 7 days, followed up for 24 months.

(b) Two courses of 7 days each at 12 months' interval followed up for 2 years.

The dose was 2 mgm./kgm. 3 times daily.

The actual effect of hetrazan on microfilariae was assessed by:

(1) Effect upon percentage of carriers.

(2) Effect on the average number of microfilariae per 20 cmm. in each positive case.

(3) Effect on the actual manifestations of filariasis.

After a single course the percentage of persons showing microfilariae fell rapidly in the first 2 days from 100 to 6·7 per cent. but rose again to 56

per cent. after the lapse of 2 years. The mean average number of microfilariae per 20 cmm. blood fell from 108 to 0·1 immediately after the course, but rose again to 14 in 2 years.

The fact that 44 per cent. of treated persons remained free from microfilariae for 2 years suggests that the adult worms had been exterminated by hetrazan. With 2 courses of treatment positives were reduced from 100 per cent. to 41 per cent. after 1 year, and 29 per cent. after 2 years. The data referring to the long-term effects of hetrazan on microfilaraemia much resemble those already published in the previous paper. That such an all-round reduction was brought about, especially in the more massive infections (100 or more per 20 cmm.), *i.e.*, from 28 per cent. of the total to 2 per cent., is obviously a noteworthy achievement. [From this it could be deduced that such a low level of microfilariaemia had been attained that mosquito transmission had been correspondingly reduced.]

This aspect of filariasis control was tested out on the island of Maiao where no DDT spraying had ever been undertaken. There dissections of wild-caught *Aëdes pseudoscutellaris* revealed that the number of mosquitoes harbouring larval filariae had been reduced to zero, 2 years after the second hetrazan course. Considering the scope of the project and the numerous staff engaged in carrying it out the total number of insects examined was surprisingly small, namely, 392 in all, and out of this total 88 only were dissected before the commencement of hetrazan treatment.

Some reference should be made to the organization of an investigation of these dimensions. The work commenced in March, 1949, at which time 32 young Tahitians were trained in the space of 3 months in parasitology, entomology, cartography, tabulation of data, blood examination, etc. At the end of this time 15 of the most promising were appointed inspectors of districts. Altogether 7,369 blood smears were scrutinized from a total of 8,976 inhabitants of these 14 districts. To complete the programme in 4 districts, Faaona, Hitiaa, Mahaena and Tiarei, comprising a population of 1,182, required a total of 155 work days, and the supervision of hetrazan treatment in the same areas took up an additional 112. [The reference to Galliard *et al.* is incorrectly quoted by the authors.]

Philip Manson-Bahr

Casile, M. & Saccharin, H. L'intradermo-réaction dans la filariose de Bancroft en Guyane française. [**The Intradermal Test in Bancroftian Filariasis in French Guiana**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 1, 137–44. [22 refs.]

Filariasis is common in French Guiana; very few of the inhabitants, irrespective of race, grow up without manifesting some signs of it. The authors maintain that even in the absence of microfilariae from the nocturnal blood, adult parasites may be present in the spermatic cord or their embryos in the genital lymphatics. There have been varied appreciations of the value of the intradermal test in diagnosis, and in this series they used the filarial antigen prepared by the Pasteur Institute of Paris from *Dracunculus medinensis*. It is used in a titre of 1 : 500 in physiological saline and keeps its activity for 3 months when stored between 0° and 4°C. It is injected intradermally in the deltoid region or in the forearm in doses of 0·1 to 0·3. A positive reaction is visible at the site of injection 5–30 minutes afterwards, forming a plaque 0·5 to 2 cm. in diameter. Delayed and even chronic reactions occur.

The authors conclude from a study of 67 persons that the filarial intradermal reaction is a test of great value, most useful in confirming the clinical

diagnosis of filariasis, and is more reliable than the presence of microfilariae in the blood. It should be widely employed to establish the filarial incidence in endemic areas.

These 67 cases showed clinical evidence of filariasis, and 31 had microfilariae, but 45 (72·7 per cent.) gave a positive intradermal test; 8 had generalized adenitis and in 2 of them microfilariae were present in the blood, but all gave a positive test. Fourteen suffered from lymphangitis; in 5 microfilariae were present, while the intradermal test was positive in an equal number.

In 8 cases of elephantiasis microfilariae were absent and in 1 only was the intradermal reaction positive.

[The figures presented above hardly substantiate this rather optimistic attitude. In making such statements the results of inoculation of at least an equal number of controls should be given; nor have the effects of other helminthic infections been taken into consideration.] *Philip Manson-Bahr*

SASA, M., HAYASHI, S., KANO, R., SATO, K., KOMINE, I. & ISHII, S. **Studies on Filariasis due to *Wuchereria malayi* (Brug, 1927) discovered from Hachijo-Koshima Island, Japan.** *Japanese J. Exper. Med.* 1952, Aug., v. 22, No. 4, 357–90, 1 fig. [65 refs.]

Filariasis is a fairly common disease in certain areas of S. Japan, and it was thought to be solely caused by *Wuchereria bancrofti*, but the surprising discovery was made of the presence of *W. malayi* in a pure focus on Hachijo-Koshima island situated some 130 km. south of Tokyo.

It has been known since 1910 that filariasis was common there. In 1912 MOCHIZUKI and INOUE made an extensive survey and made special note of the absence of scrotal swellings and chyluria, points of differentiation in the clinical aspect of filariasis due to *W. malayi*, as we now know it.

The epidemiological aspect is interesting in so far as this islet represents an entirely isolated endemic focus far removed from any other known endemic area. The main vector is probably *Aëdes* (*Finlaya*) *togoi*, not only a new species but also a new subgenus in the transmission of *W. malayi*.

The islet is about 3·16 sq. kilometres on latitude 37°7′N. and longitude 139°40′E. It is close to the main island of Hachijo, separated solely by a channel 4 km. wide. It is volcanic and conically-shaped. The numerous rock holes near the sea-shore containing rain or brackish water serve as breeding grounds for mosquitoes.

The island is covered with jungle, rainfall is extremely abundant, but no streams, swamps or lakes are present with the exception of one small, natural pool. The climate verges on the subtropical and compared with Tokyo it is much warmer in winter with higher humidity. The area is frequently exposed to severe typhoons. There are two small villages with populations of 100 and 70 respectively. The inhabitants live by agriculture and fishery. There are no rice fields for mosquito breeding. Most of the houses have a concrete rain-water reservoir which constitutes their sole source of water and the main mosquito breeding place.

It is not clear where and at what time filariasis was introduced, but it is attributed to castaways from Korea or S. China where *W. malayi* abounds. The disease has been known locally as *Baku* and has been feared so much that the population has been reduced by emigration of the younger generation from the island.

Blood smears from inhabitants of Koshima contained exclusively microfilariae of *W. malayi* with the exception of one mixed infection with *W. bancrofti* from Okinawa. The morphological characters of the microfilariae

were typical of *W. malayi* and were almost identical with those described in BRUG's original paper as well as those so carefully described by FENG [this *Bulletin*, 1934, v. 31, 805]. The fixed points, in comparison with those of microfilariae of *W. bancrofti*, were measured by Hayashi and agreed closely with those of Feng.

No adult forms of *W. malayi* have yet been recovered from Koshima.

An epidemiological survey was commenced in the summer of 1948 and continued in 1950. In Toriuchi-Mura village, the blood of 93 of 107 persons was examined at midnight; out of 85 who had lived there for more than two years 34·1 per cent. were positive. The microfilarial density was moderate; the maximum per thick drop was 15; the minimum was 1. Males and females were equally infected. At the ages of 6–10, 40 per cent. were infected, but the incidence gradually increased to the maximum (73 per cent.) between the third and fourth decades. Clinically the filariasis manifested itself in 4 stages:—the incubation period (stage I), the initial period of clinical manifestations, the stage of repeated filarial attacks, and finally the stage of elephantiasis (stage IV). In about 50 per cent. symptoms were noted at the age of 13. The average age of onset of elephantiasis was 41; the earliest 31. The percentage of "symptom positives" gradually increased with age, attaining 100 per cent. in ages higher than 41. Those who had no microfilaraemia, no symptoms and were apparently healthy were found only among the young people. No one could live in Koshima for more than 30 years without being affected by Malayan filariasis.

Culex pipiens var. *pallens* is one of the most common species of mosquito —though *Aëdes togoi* is the commonest and is probably the most important vector. The larvae are found in artificial water containers close to human dwellings. This species attacks man and animals both by day and by night. Larvae of *W. malayi* were recovered on dissection of this species, varying in length from 1431·5 to 1625·0 μ. No representatives of *Mansonia* or *Anopheles* were collected.

Periodicity was tested out in 6 volunteers. It was strictly nocturnal, the maximum numbers occurring between 8.0 p.m. and midnight.

In mosquito control, emulsifiable wettable phenothiazine dust, containing 30 per cent. of active ingredient, was employed. This, when applied to 2 reservoirs, proved an effective as well as safe larvicide. It had to be repeatedly applied. The introduction of fish (*Oryzias latipes*) proved very effective.

A modification of hetrazan, *Sapatonin* (1-diethylcarbamyl-4-methylpiperazine citrate), experimentally prepared by Tanabe & Co., was tested for use in control of Malayan filariasis. It proved to be highly efficacious against microfilariae. In a strength of 2 mgm./kgm. it was administered three times daily by mouth. After 10 days' interval all who took total doses more than 26·7 mgm./kgm. became negative, while those who took a larger dose, 60 mgm./kgm., were still free from microfilariae after 4 months. The microfilaria positives which were 34 per cent. before mass treatment decreased to 16·2 per cent. after 4 months and were 20·8 per cent. after 14 months. The drug was effective in curing the acute attacks of the disease, but elephantiasis was unaffected. Side effects were seen in most cases. Fever, headache, lumbar pains, nausea or vomiting, nodular swellings and skin swellings were most frequently encountered. These reactions were most marked in those who harboured the greatest numbers of microfilariae. It is concluded that this drug is probably more efficient in Malayan than in Bancroftian filariasis. It is suggested that its long-term effect is in killing the adult filariae as well. *Philip Manson-Bahr*

HAWKING, F. **The Periodicity of Microfilariae. III. Transfusion of Microfilariae into a Clean Host.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Jan., v. 47, No. 1, 82–3, 1 fig.

"In order to obtain evidence whether the periodicity of microfilariae persists in the absence of the adult worms, various investigators have transfused blood containing microfilariae into a clean host. The subject was reviewed in the previous paper of this series [HAWKING and THURSTON, this *Bulletin*, 1952, v. 49, 1141], and it was concluded that the records of such experiments do not yield a decisive proof of the matter. More recently an experiment with mf. repens of the dog has been carried out in which the results are unequivocal and is here briefly described."

A total of 62 million microfilariae of *Dirofilaria repens* in 150 cc. of blood were transfused into an uninfected dog (purchased in England) and weighing 8·6 kgm. Assuming a blood volume of 74 cc./kgm., the expected count would have been 1,100 microfilariae per 100 cmm. but the count immediately after transfusion was 190 microfilariae per 100 cmm.: 83 per cent. of the microfilariae therefore did not appear in the peripheral circulation. During the next few days the counts showed a diurnal cycle. A week after the transfusion, counts were made on both donor and recipient dogs. The periodicity of the microfilariae in the blood of the recipient dog was practically indistinguishable from that of the donor dog, allowing for the difference in concentration. Periodicity is therefore independent of the presence or absence of adult worms.

The blood thereafter showed diminishing numbers of microfilariae until they disappeared 68 days after transfusion. [The results of this experiment show decisively that the phenomenon of periodicity, though it involves the host, is equally a property of the microfilariae of the species of filaria concerned.] *W. E. Kershaw*

i. SCOTT, J. A. & MACDONALD, Etta M. **Experimental Filarial Infections in Cotton Rats.** *Exper. Parasit.* New York. 1953, Apr., v. 2, No. 2, 129–40.

ii. MACDONALD, Etta M. & SCOTT, J. A. **Experiments on Immunity in the Cotton Rat to the Filarial Worm,** *Litomosoides carinii. Exper. Parasit.* New York. 1953, Apr., v. 2, No. 2, 174–84. [13 refs.]

The authors have tried several methods with a view to achieving quantitative transmission of *Litomosoides carinii*. A good deal of progress in this difficult field has been made and interesting interpretations of the early effects of experimental reinfection of cotton rats are now practicable.

i. Experimental work with this material depends, of course, on producing adequate numbers of infective *Bdellonyssus bacoti*. The methods used are briefly outlined. Natural transmission occurs when mites are feeding on the cotton rat but the authors have been concerned to infect the host by inoculating directly into the abdominal cavity or, more usually, into a subcutaneous incision or pocket, infective larvae dissected from mites. Details are given of several methods used to effect the transfer of the larvae from the dissected mite into the incision. The most satisfactory method was that of dissecting the vector in a drop of half-strength Tyrode solution and transferring the larvae by micropipette to a coverslip. Damaged worms were removed and the others counted. These were then flushed into the subcutaneous pocket of the anaesthetized cotton rat and the incision was sutured. The number of worms still remaining on the coverslip was counted

and deducted from the original count to obtain the estimate of the numbers transmitted. The subcutaneous pocket appears to have been made in the abdominal wall but this is not specifically stated. Modifications of this method include the use of full-strength Tyrode solution, enclosing the larvae first in gelatin capsules or inserting infective mites into the pocket and so on. At various intervals after this operation the abdominal cavity and pleural and pericardial cavities were thoroughly washed out in saline and the growing worms were removed and counted. The cotton rats used were laboratory-bred from birth.

A table shows that in 54 cases of transmission by the method of choice, or sometimes by one of its modifications, 10 to 125 infective larvae were transmitted and recoveries of growing worms 8 to 87 days later (in only 2 instances were autopsies actually later than 38 days after the operation), varied from 14 to 80 per cent. In the 35 animals infected by flushing larvae from the coverslip into the pocket the mean recovery of growing worms was 53·3 per cent. (range 28 to 72 per cent.). It is the comparative simplicity and convenience of the coverslip method which recommend it as preferable to the other procedures; it is not necessarily more precise.

A series of other experiments is reported in which either ruptured or undamaged infective mites, or infective larvae removed from mites, were inserted intraperitoneally into cotton rats. No worms developed when undamaged mites were inserted; but some succeeded in developing from ruptured mites, and, when introduced as free infective larvae, up to as many as 20 of 40 larvae developed. The mean recovery of growing worms from 5 rats killed 29 to 170 days after the intraperitoneal inoculations of 6 to 44 infective larvae was 33·6 per cent. Although a few exceptions occurred, most of these larvae migrated to the thoracic cavity and this occurred as quickly as 2 days after inoculation. Almost all of the worms obtained after subcutaneous insertion of infective larvae, as described above, were also found in the thorax.

These findings are then compared with the work of other authors reporting on quantitative transmission [this *Bulletin*, 1951, v. 48, 60] and the mode of transmission [*ibid.*, 1948, v. 45, 265, 629]. It is concluded that the present approach to the problem of quantitative transmission is satisfactory for its immediate purpose. [The reviewer, whose work on quantitative transmission of this infection is carefully considered and compared by the authors, would agree substantially.]

As regards the mode of transmission by the mite, the present work confirms that transmission takes place when the mites are feeding on the host and that swallowing infective mites, even if they be ruptured in the rat's buccal cavity or in its stomach, does not lead to infection. How and where the worms leave the mite in natural transmission during feeding is still unknown.

The growth of those few worms which, in these experiments, remained in the peritoneal cavity was such that the peritoneal cavity appeared to be as suitable for worm development as the pleural cavity. Nevertheless, the pleural cavity is selected by the worms more frequently than the peritoneal cavity; this is observed also in naturally acquired infections. In general, the peritoneal cavity is parasitized only when the infection of the pleural cavity is fairly heavy.

ii. This paper reports on experiments in which living infective larvae removed from mites are transmitted by the technique of the subcutaneous pouch to cotton rats previously infected also in this way, or previously inoculated with dead infective larvae (killed by freezing) by the same method, or inoculated with adult worms, dead and alive.

In the experiments with cotton rats previously infected with living infective larvae, the initial immunizing infection consisted of a single exposure or a series of 5 exposures at intervals of 4–7 days. A challenging infection with living infective larvae was made 44–77 days later. After a further 24–38 days the cotton rats were killed, together with control animals which had not been previously immunized but had been exposed to infection on the occasion of the challenges. It was always possible to distinguish by length the female worms of the immunizing and the challenge infections, but the males could only be distinguished at the shorter interval of 24 days. The challenge infections were of estimated numbers of infective larvae, transmitted as described in the first paper, and the results are examined by statistical treatment for evidence of fewer growing worms in the challenge-infection than in the control infections. There is some evidence, particularly when both sexes of the challenge infection could be recognized from the immunizing infection or infections, that rather fewer worms developed in immunized rats than in previously uninfected controls (43 per cent. developed in immunized rats whereas 56 per cent. of the estimated transmission was successful in control animals).

Retarded growth of worms in challenge infections in animals immunized by previous infection by means of living infective larvae was also observed when comparison of female lengths was made with worms from control infections. The mean length of females from animals immunized once was 13 mm. less, and from those immunized on 5 occasions 24 mm. less, than worms from control animals. It is not known whether the difference between the test worms from the 2 groups of immunized cotton rats is a consequence of the repeated reinfections in the latter group or the greater total number of worms which this group of cotton rats harboured before challenge.

Further evidence of the immunizing effect of an earlier infection is derived from a comparison of moulting rates in the 24-day observations. In immunized animals never more than 6 per cent. of the test worms had moulted by this time, and, in control rats, never less than 41 per cent. had moulted.

When, however, challenging infections of infective larvae were given to cotton rats previously inoculated with one or more doses of killed infective larvae (about 4 times as many killed larvae were used as in immunizing transmissions with living larvae in the experiments above) no satisfactorily consistent evidence of failure to infect, of retarded growth, or of delayed moulting of the test worms was obtained. This may be due to rapid destruction of antigenic substances in dead larvae; it may be implied that living worms or the production of their metabolites are necessary to maintain antigenic materials.

Finally, immunization with transplants of 22 to 100 adult worms (sexes about equal) gave some general indication of a slight retardation of growth and of delay in the moulting of the challenge infection. Greater numbers of adults, or repeated transplants of them, might emphasize the small amount of immunizing effect which was just detectable.

These results are then briefly discussed and compared with similar but more marked effects in infections of white rats. It is suggested that both types of rat react to infection to different degrees, their immunological responses being expressed in a general retardation, but at different rates, in the development of the worms.

Brief reference is made to preliminary observations which indicate that precipitin reactions occur with *L. carinii* in association with the immune responses of the host. *D. S. Bertram*

KERSHAW, W. E. **The Early Migration-Rate of the Infective Larva of *Litomosoides carinii* in the Cotton Rat.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 68–73, 1 diagram.

On 10 occasions, numbers varying from 25 to 52 of *Bdellonyssus bacoti* harbouring infective forms of *Litomosoides carinii*, were released to feed on the scarified tail of uninfected cotton rats. The method used, previously developed for feeding mites on the tail of white rats [this *Bulletin*, 1946, v. 43, 1197] is illustrated in a diagram. The tail of each cotton rat was cut off near the base when engorgement of the mites was complete, the interval between the 2 events varying from 2½ to 48 hours in the series of 10 experiments. The rats were then kept alive and examined later for evidence of infection by autopsy for adult worms or for the presence of microfilariae in the peripheral blood. No infections were obtained when the tail was removed 8 hours or less after the mites had fed on it; but infections occurred when the interval was 18 hours or more. It is estimated that the infective larvae migrated at least 4 cm. from the site of their inoculation by bite in at least 18 hours. It would seem that they do not enter the blood or lymphatic vessels immediately on transmission; they may remain at the site of inoculation for some time or proceed slowly between, for example, connective tissue layers. Preference is expressed for the latter view. In conclusion, the cycle of development of this parasite in the definitive and intermediate host is briefly reviewed with emphasis on the rapid migratory phase and morphological changes which follow changes in environment during the cycle. *D. S. Bertram*

FREER, Philippa M. **Observations on the Early Fate of the Microfilariae of *Litomosoides carinii* (Travassos, 1919), Filarial Parasite of the Cotton Rat, after their Ingestion by the Vector, *Bdellonyssus bacoti* (Hirst, 1913).** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 13–25, 2 figs.

Within a few hours of the ingestion of the microfilariae of *Litomosoides carinii* from cotton rats by the mite *Bdellonyssus bacoti*, a high proportion of the microfilariae, as seen in smears of whole mites stained with Leishman's stain, appear to have left their sheaths. But the number of sheathless microfilariae, even within 2 hours of ingestion, is very much less than the number of empty sheaths. Thus, in a preliminary classification of different microfilarial forms seen in 25 smeared mites, totals of 3,568 empty sheaths, 1,407 sheathed microfilariae, but only 105 sheathless microfilariae were counted (71·7, 28·3 and 2·0 per cent. respectively of the estimated intake of microfilariae). Comparison of this sort of data with counts of microfilariae seen in serial sections of mites of the same series indicated that the deficiency in numbers of sheathless microfilariae was not due to their mechanical disruption during the smearing process. Various methods of smearing infected blood of cotton rats further confirmed that disintegration of microfilariae was not likely to arise solely on account of the physical stresses arising from smearing. Continued investigation of the fate of these missing microfilariae revealed that large numbers of microfilariae rapidly became completely or almost completely enucleated after ingestion. The partially enucleated forms usually have only a few nuclei at one or both ends. The enucleated parts stain so poorly that these enucleated forms of microfilariae in smears of mites are easily missed; this also applies to sections stained with Giemsa or Mayer's haemalum. Such forms are found within sheaths as well as free of them after ex-sheathing has occurred.

Both in mite smears and in sectioned mites some evidence was found of these partially enucleated microfilariae, with and without sheaths, occurring in large cells in the lumen of the gut or in cells of the gut epithelium. It remains uncertain if this should be interpreted as an invasive phase of the microfilariae into these cells or as phagocytosis by the cells. Some preference for the former view is expressed. Nor is it certain that the disintegration of the microfilariae to the enucleated stage occurs only when they are involved with these cellular elements; there is indeed some indication that the enucleation frequently takes place while microfilariae are in the lumen of the gut and free of association with any cells.

It is established that some microfilariae penetrate to the haemocoele within 24 hours and then, as is well known, undergo further development over 14 days (at 24°C.) to become infective forms. But few of those ingested complete this development (only 4 per cent. in one series studied in detail) and it is supposed that the majority suffer the early degenerative changes described. Exceptionally, a microfilaria appears to be capable of persisting unmodified for several days in the gut and proceeding then to begin belated development. It remains uncertain when and where these microfilariae which develop normally escape from their sheaths.

D. S. Bertram

Gordon, R. M. & Crewe, W. **The Deposition of the Infective Stage of *Loa loa* by *Chrysops silacea*, and the Early Stages of its Migration to the Deeper Tissues of the Mammalian Host.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 74–85, 6 text figs. & 17 figs. on 4 pls. [11 refs.]

Observations are presented on the mechanism of biting by *Chrysops silacea* and the mode of transmission of *Loa loa* which amplify earlier observations on the transmission of this parasite by *C. silacea* in the British Cameroons [this *Bulletin*, 1950, v. 47, 1214]. A detailed account of the posture and inter-relationships of the various structures of the mouthparts during feeding by the fly is given and illustrated by line drawings and photographs. As the fly presses its head down to thrust its fascicle (the cutting and suctorial parts formed respectively by the mandibles and maxillae and the labrum and hypopharynx) into the host's subcutaneous tissues, the labella remain on the skin surface and the labium is sharply flexed backwards; they become deflated and compressed. Usually several thrusts of this sort are made before a fly starts to imbibe blood from the mammal. It would appear that a haemorrhagic pool sufficient to satisfy the fly (about 30 cmm. of blood are usually ingested) is made first and that this is then sucked up rapidly, usually within one minute. As the fly withdraws the mouthparts after feeding, the labium remains flexed for a few seconds so that the fascicle is seen as a downwardly directed process passing between and beyond the labella. In sections, the tip of the labrum has been observed 600 μ below the skin surface; the tips of the maxillae have been observed at 800 μ from the surface. Whether this different depth of penetration is real or induced by the method of preparing the material for sectioning is uncertain.

The haemorrhage produced by *Chrysops* in the human skin is deep-seated and seldom observed superficially. Probably it is caused when salivary fluid, shown to contain an anticoagulant, is discharged from the hypopharynx into the blood which escapes into the cutis vera from capillaries lacerated during the probing activities of the mandibles and maxillae. Invasion of the underlying muscles by blood has been observed in *Chrysops* bites. A powerful coagulant in the fly's gut clots the blood after ingestion.

In *C. silacea* harbouring infective forms of *L. loa* there may be 200 or more larvae. They may be found in the head, labium, thorax and abdomen but, so far, even when large numbers occur in the head and labium, they have been absent from the labella. Large numbers of infective larvae leave the fly when it is feeding and some may be seen gliding down the extended fascicle protruding beyond the flexed labium in the few seconds after the withdrawal of the mouthparts at the end of the blood meal. Escape of the larvae from the fly first begins when the labium becomes flexed during feeding and it is thought that they may leave the labium by penetrating its membranous base.

Infective forms of *L. loa* were placed on recently excised pieces of human skin and infective *C. silacea* were allowed to feed on similarly excised human skin. Subsequent sectioning demonstrated the presence of larvae deep in the subcutaneous tissues after the *Chrysops* bites but none was found when larvae had been released on unbroken skin. From this it is concluded that *L. loa* cannot penetrate unbroken skin and that when infective *Chrysops* are feeding there may also be a wastage of infective forms which do not effect an entry, but some will be successful by invasion of the subcutaneous layers through the wound made in biting. In view of the large numbers which may be released, transmission of the *L. loa* by *Chrysops* can, despite, the wastage, be considered as efficient.

In studies of sections of skin of guineapigs 35 minutes after bites by infective *Chrysops*, the infective larvae were found usually in or below the cutis vera. In one exception, in which the time interval was 25 minutes, some larvae also occurred in the stratum corneum which, however, appeared to have suffered abrasion. The worms were either near the fascicle, in the haemorrhage of the bite, or at some distance from them in the tissues, suggesting that some migration may have already begun. It would seem that within about 40 minutes of the first probings by a fly infective larvae can be transmitted and penetrate by further migration into the interfascial planes of the muscles below the cutis vera. The time taken to effect similar penetration in the human host would probably be greater in view of the greater distance between the skin surface and underlying muscle.

D. S. Bertram

Nicholas, W. L., Kershaw, W. E., Keay, R. W. J. & Zahra, A. **Studies on the Epidemiology of Filariasis in West Africa, with special reference to the British Cameroons and the Niger Delta. III. The Distribution of *Culicoides* spp. biting Man in the Rain-Forest, the Forest Fringe and the Mountain Grasslands of the British Cameroons.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 95–111, 1 map, 7 graphs & 7 figs. on 2 pls.

As a corollary to earlier investigations [this *Bulletin*, 1951, v. 48, 574; 1952, v. 49, 888] a survey was made in the British Cameroons between June 30 and December 2, 1952, of the species of *Culicoides* attracted to man in 16 different localities ranging in a transect from coast to hinterland through rain forest (11 localities), mountain grassland (4 localities), to savannah with relict forest (1 locality). The distribution of these zones and places is shown on a map. One to 6 catching sites were sampled in each locality, including sites in or close to villages and their plantations (particularly of banana and plantain), missions, riverside houses and wharfs, rest-houses, plaintain farms, forest, and near streams and waterholes in the drier areas. Details of these sites are given for each locality and several photographs illustrate the features of sites typical of the 3 zones. The

graphs, which are of seasonal rainfall, show also that most of the sampling in the rain forest was done in the rains but elsewhere the dry season was just beginning.

Culicoides grahami, *C. austeni*, *C. inornatipennis*, and *C. fulvithorax* were taken on human bait throughout the rain-forest zone. *C. distinctipennis* occurred only near mangrove swamp. *C. grahami* and *C. austeni* were the commonest man-biters, both in villages and in forest reserve. *C. austeni* was commoner in villages than in forest reserve. Their presence in villages can be associated with their known breeding places in rotten stumps of banana plants and plantains but, since these plants were absent in the forest reserves, other breeding places must exist. There is evidence that a variety of aquatic habitats rich in organic matter are used by both species. Similarly, with *C. inornatipennis* and *C. fulvithorax*, there is reason to suppose from their presence in the forest reserves that they breed elsewhere, apart from banana and plantain; the former is recorded as developing in rot-holes of trees. It is doubtful if *C. fulvithorax* and *C. distinctipennis* are important man-biters.

C. grahami only was taken in mountain-grassland terrain—always close to streams and not closely associated with banana or plantain. It may breed in wet mud in this zone. Although the findings for this zone rest on a survey of only 7 days the authors have some justification for believing that the two night-biters, *C. austeni* and *C. fulvithorax* are absent from the mountain-grassland zone.

In a very brief visit to savannah with relict forest only *C. grahami* and *C. inornatipennis* were found.

Banana and plantain are reputed to be introduced from the Orient. It would seem that they provide for *C. grahami*, *C. austeni*, *C. inornatipennis* and *C. fulvithorax* breeding places additional to those they have utilized in forest before these cultivated plants were available. In the case only of *C. austeni* there is evidence in the present survey that the biting density for man is, as a result, increased in the villages. *D. S. Bertram*

ZAFFINO, C. L'ossiurosi nelle colonie estive. [**Enterobiasis in a Health Resort**] *Riv. di Parassit.* Rome. 1953, Jan., v. 14, No. 1, 19–21.

The English summary appended to the paper is as follows:—

"A pin-worm survey has been undertaken by the author in two children's health resorts, from the first to the last day of their activity. Promiscuous life within the resort, as suspected, was found to contribute to the diffusion of the parasite. In fact, the parasite rates were 84·34% at the onset and 98·26% at the end of the first resort's activity while 67·12% and 87·66% for the second resort. White cell counts of 65 patients showed, in most cases, a constant increase of eosinophiles."

PUBLIC HEALTH REP. Wash. 1953, Apr., v. 68, No. 4, 416–20, 1 diagram. **Trichinosis Prevalence, Transmission, Prevention. Highlights from the First National Conference on Trichinosis, 1952.** [Précis of conference discussions prepared by eight discussants (LINK, V. B.; STEELE, J. H.; SCHWARTZ, B.; GOULD, S. E.; MILLER, A. R.; AUGUSTINE, D. L.; GOMBERG, H. J.; SUSSMAN, O.).]

This Conference was held in Chicago in December, 1952, and was sponsored by prominent American medical and veterinary organizations. Brief summaries are given of 8 of the conference discussions. LINK writes on the health and economic aspects of trichinosis. He quotes figures to

suggest that 1 in 6 persons in the U.S. probably harbour trichinae, and it is estimated that 4·5 per cent. of these may have symptoms. As the annual average number of cases reported in the last 10 years has been 336 (compared with the above estimate of incidence which would indicate 350,000 new infections each year) it is clear that many have been missed. It is also estimated that 1·5 per cent. of 60 million pigs killed annually are infected, and almost half are fed entirely on raw garbage.

STEELE discusses the part played by garbage in transmitting disease to man, and stresses the need for legislation to control garbage feeding and to eliminate the use of raw garbage for this purpose. SCHWARTZ points out that the domestic pig is the only mammalian host of *Trichinella* of importance to human health and shows that infection in them is much less in the U.S. than it used to be. In a recent survey 0·6 per cent. of pigs in corn-belt States were found to be infected, while in another area where they were fed on garbage the figure was 11·5 per cent. GOULD states that the average incidence of *Trichinella* larvae in 10,000 human autopsies was 16 per cent., but with more thorough methods of examination, it may be 30 per cent. Data indicate that the incidence of trichinosis is higher in the U.S., in man and pigs alike, than in any other country. In those cases severe enough to be diagnosed clinically, the mortality is about 5 per cent. Methods of prevention are referred to briefly. MILLER discusses such methods and their success.

AUGUSTINE quotes recent studies indicating that pork may be made safe against trichinosis by rapidly lowering its temperature to –35°C. or by lowering it to –18°C. and then storing it at that temperature for 3 days. This greatly reduces the time required. GOMBERG gives some details of the effects of ionizing radiation. It has been found that about 1 million roentgens of 200 kv. X-rays are needed to kill all larvae irradiated *in vitro*. The killing dose of cobalt–60 gamma rays (1·17 and 1·31 Mev.) was found to be about the same. Much smaller doses will sterilize female *Trichinella* and prevent reproduction. It is believed that large sections of meat, such as pig carcasses could, under suitable conditions, be irradiated as a whole, because of the great penetrating power of cobalt–60 radiation.

SUSSMAN discusses State problems in control of garbage-borne disease and recommends that (1) inter-State movement of raw garbage should be prevented, except under specified conditions; (2) movement of live pigs should be prohibited out of any State failing to have and to enforce regulations requiring the cooking of garbage given to pigs. *H. J. O'D. Burke-Gaffney*

THOMAS, Elizabeth H., BOZICEVICH, J. & HOYEM, Helen M. **Flocculation Reactions in Rabbits experimentally infected with** *Trichinella spiralis*. *J. Infect. Dis.* 1953, Jan.–Feb., v. 92, No. 1, 89–96, 1 fig.

"1. The flocculation and complement fixation tests yielded no falsely positive results with 162 serum samples drawn from 42 uninfected rabbits.

"2. Both tests were capable of detecting specific antibodies in rabbits infected with *Trichinella spiralis*. The first positive test was obtained by both methods with a serum drawn 6 days after infection. Flocculation antibodies were demonstrated in 33 of the 34 infected animals within 27 days, and complement fixation antibodies were demonstrated in 33 of the infected animals within 20 days.

"3. The rise of antibody titers given by the two tests paralleled each other, with the complement fixation test giving higher titers by 2 to 3 serial dilutions.

"4. A 1+ or 2+ reaction seems of diagnostic value in the flocculation test for trichinosis in the rabbit.

"5. The flocculation antigen should be controlled for loss of sensitivity, and serum tested within a few days after bleeding should be inactivated before use."

BULLOCK, W. L. **Phosphatases in Experimental** *Trichinella spiralis* **Infections in the Rat.** *Exper. Parasit.* New York. 1953, Apr., v. 2, No. 2, 150–62, 13 figs. on 3 pls. [31 refs.]

DEFICIENCY DISEASES

MENDOZA MENDOZA, P. Contribucion al estudio de la desnutrición en el niño. [**Malnutrition among Porto Rican Children**] *Bol. Asoc. Méd. de Puerto Rico.* 1953, Feb., v. 45, No. 2, 58–70. 9 graphs.

This contribution is an analysis of 102 cases of malnutrition among 902 children admitted to the Children's wards of the Aguadilla District Hospital during the year July, 1951–June, 1952. The information is chiefly of local interest. Among the 102 there were 29 deaths, 16 within 48 hours of admission. Of the 102 patients 49 were males, 53 were females and the average stay in hospital was 33 days. A graph shows the zones from which the patients came; 26 from Aguadilla itself, 18 from San Sebastian, 16 from Aguada and 15 from Isabela; smaller numbers came from 5 other districts. The numbers according to age were 25 (up to 1 year), 17, 20, 15, 5, 6, 1, 1, 1, 1, 0 and 1. Oedema, general with anasarca, or of face and eyelids, hands and arms, was one of the commonest early signs and was seen in 83 (the author quotes some of the low serum protein levels found associated with it); diarrhoea was present in 98, fever in 29, wasting in 25. Concomitant infections included enterocolitis in 15, impetigo (13), suppurating otitis media (12), bronchopneumonia (10), aphthous stomatitis (6). The chief causes of death were bronchopneumonia and enterocolitis with debility and wasting. The oedema rapidly disappeared, usually in 8–10 days after the treatment began; diarrhoea and vomiting, when present, might persist for 3 to 4 weeks.

Faecal examinations were made in 81 patients and 47 had helminthic infection, 4 of them in their first year. The commonest were *Trichuris* 20, *Trichuris* and hookworm 9, the same number had hookworms alone and also the above two with *Ascaris*. The author was not able to give details of the blood changes. *H. Harold Scott*

HAEMATOLOGY

WADSWORTH, G. R. **The Red Cell Count of Normal Men and Women living in a Tropical Climate.** *Med. J. Malaya.* 1952, Dec., v. 7, No. 2, 104–6.

Because of the limited amount of information on the effect of race, diet and climate on the red cell count, the author studied the counts of 77 men and 28 women in Singapore. There were 34 Europeans, resting under basal conditions or engaged in normal activity, and all had been at least 6 months in Malaya. There were 71 Asian students and the blood was collected

during class experiments. The Asians had lived in the tropics all their lives. All subjects were aged between 19 and 30 years.

Blood was taken from the ante-cubital vein, with the subject recumbent. Details are given of the elaborate precautions taken to ensure accurate counts; in a preliminary experiment, very close agreement was found between counts made independently by 2 observers. Single counts were made on each specimen, but the author has no reason to believe that replication would have increased the accuracy of the mean figures or that the counts of the European men were affected significantly by the basal conditions.

The results for each race and for all males and all females are given in a table. The mean red cell counts for men and women respectively were 5·3 and 4·3 million per cmm. Differences between the races were not significant in the case of men, but the groups of women were too small for individual statistical assessment.

The author computed the mean red cell counts of 1,381 normal men and 460 women living in temperate climates, from various papers. The figures were respectively 5·2 and 4·6 million/cmm. His own results differed from these by less than 10 per cent. and it was thought that this was not a great enough difference to suggest racial or climatic influence. It is noted that MacGregor and Loh [this *Bulletin*, 1942, v. 39, 53] found significantly higher red cell counts in Asians than in Europeans in Singapore. The present author attributes his failure to confirm this to his small series, to altered nutrition since the war, or to the fact that the Asian subjects studied by him were from a higher social grade. He quotes MacGregor as believing that any difference in the racial group was due to dietetic differences rather than to an effect of race as such. The author's findings support this view, and he concludes that race and climate did not affect the red cell count in his series. [For a similar study by the author on the packed red-cell volume in the tropics, see this *Bulletin*, 1953, v. 50, 149.]

H. J. O'D. Burke-Gaffney

Eagland, R. D. **A Report on Anaemia in Estate Labourers, Malaya.** *Med. J. Malaya.* 1952, Sept., v. 7, No. 1, 36–8.

This is a report on the application on a large scale of knowledge of anaemia treatment gained in a careful clinical investigation of a smaller number of selected cases. It was found in an Estate Group Hospital which served 2,700 people that between 4–7 per cent. showed gross anaemia, and that many others were noticeably anaemic. The cause was a combination of ankylostomiasis and malnutrition, and it was planned to follow disinfestation by standard treatment for hypochromic anaemia reinforced by a good diet.

The investigation was in two parts: cases of anaemia were sorted out by the Tallqvist scale for the measurement of haemoglobin; all below 60 per cent. (and 90 per cent. if pregnant) were urged to enter hospital. The rest had ambulant treatment, which consisted of an initial treatment followed by an iron preparation in optimum dose supplemented by tablets of ascorbic acid and vitamin pills.

The patients who were admitted to hospital numbered 92, and 90 of them had *Ankylostoma* in their stools. They were treated until the ova were much reduced or absent. It was rarely necessary to exceed 2 treatments. An early morning dose of 2·7 cc. of tetrachlorethylene and 0·3 cc. of oil of chenopodium in 27 cc. of liquid paraffin was given. This was followed by 7 gm. of magnesium sulphate in water one hour later and before breakfast.

Hospital diet contained 2,223 total calories, 97 gm. total protein of which about 50 gm. were first class protein, 50 gm. fat, and 357 gm. carbohydrate, 287 mgm. calcium and 14 mgm. iron. To this was added a supplement of 27 gm. calcium caseinate and 4 gm. of "Marmite". This added 24 gm. of protein, 340 mgm. calcium, and enriched the supply of B vitamins. Ascorbic acid was given in tablet form, 100 mgm. per day, and "Multivite" vitamin tablets were given t.d.s. Iron was given mostly as 6 gm. of ferri et ammonii citras per day.

The cost of this diet, including the supplements and the iron and vitamin preparations, was 92 cents per patient per day (Malayan currency in 1951).

The results were very satisfactory. There were no deaths and all, except 7 patients, were discharged with a haemoglobin percentage of 90 or over. A few cases followed up showed a continued rise up to 120 per cent.

H. Lehmann

LAMPRELL, B. A. & CHEEK, Elizabeth. **Anaemia in Southern Indians employed on Malayan Plantations. A Review of Causes, and Methods of Treatment in an Exceptionally Anaemic Population.** *Med. J. Malaya.* 1952, Dec., v. 7, No. 2, 107–14, 1 diagram.

This investigation concerns itself with the extent and causes of anaemia in an exceptionally anaemic estate population in Selangor. The people under consideration consisted of 1,375 labourers and their dependants, and were an old-established Tamil labour force. The estate was virtually free from endemic malaria, but 70 per cent. of a representative cross-section of the population were found to be infected with *Ankylostoma duodenale*, 23 per cent. being recorded as "very heavy infections," and 58 per cent. were found to be infected with *Ascaris lumbricoides*.

This investigation is valuable from two points of view: it provides information on the anaemia as such, and on examining its causes the authors have studied living conditions very carefully and have made what almost amounts to a study in the field of social anthropology. A significant observation was that the population for the last five years had become comparatively wealthy, but that there appeared to be a "firmly established tradition that money spent on food was money wasted". It seems that, rather than purchase good food, the people would buy jewellery, bicycles and luxuries such as gramophones and wireless sets, and would hire vehicles for expensive jaunts into the neighbouring town. Large sums of money were remitted to India.

In December, 1950, 268 persons were examined, and 100 in February, 1952, and, whereas on the first survey the incidence of severe anaemia (below 6 gm. per cent. haemoglobin) was greater than that seen in other Southern Indian labourers; on the second survey it was lower than that seen in a comparable population. The improvement was particularly obvious in children, in whom severe anaemia had almost disappeared. Between 1950 and 1952, dispensaries had been opened in each division of the estate, and were attended daily by hospital assistants, who treated out-patients on the spot and arranged for admission to hospital for those requiring it. A midwife visited divisions periodically throughout the year, and pregnant women were brought under much closer medical supervision very early in pregnancy. Iron and vitamin B tablets were made easily available, and were issued in large quantities.

There is also a study of the treatment of 14 persons with severe anaemia. In 5 of them the MCV and MCHC, as well as the red cell count, are given. They all indicate severe iron-deficiency anaemia. On treatment with iron and hospital diet improvement seems to have been universal. One

case is described as having a rise within the first week of 3·7 gm. per cent. [With a blood volume of 4–5 litre, this would suggest the daily manufacture of 20–25 gm. haemoglobin. One wonders whether there had been a change in blood volume, to yield such a startling result.]

In all cases there was excellent improvement within the first month, after which all 14 asked for their discharge.

There were re-examinations two months later, during which time the patients had been provided with iron medication but it was, of course, not certain that they were all still taking this regularly. A number of people had slightly improved, some were stationary, and some haemoglobin values had even fallen again.

Thus, whereas the initial haemoglobin had been below 6 gm. per cent., it was between 8 and 11·5 gm. per cent. in all cases after 4 weeks, but there was no substantial improvement after a further period of 2 months. At the same time, there was universal macrocytosis after 3 months, with normal MCV and low MCHC.

[This suggests that the macrocytosis was due to the presence of reticulocytes or early post-reticulocytes, and one wonders whether peripheral blood loss neutralized the dietary improvement and whether, after the iron deficiency had been successfuly treated, another difficulty remained and prevented further recovery.

Had the abstracter seen this picture in Uganda, he would have been certain that hookworm anaemia had been corrected for its iron deficiency, but that complete cure had not been effected because the hookworms had not been successfully removed. A very rapid improvement of a very severe anaemia on iron treatment, followed by a standstill after four weeks with appearance of macrocytosis, was typical for this situation. Successful treatment of worm infestation, in addition to the dietary treatment, eliminated the halt in improvement after one month and produced a complete cure within less than three months, with a haemoglobin percentage of 14 gm. per cent. and above.] *H. Lehmann*

TASKER, P. W. G., WHELAN, J. F. P. & CHEEK, Elizabeth. **Further Investigations on Anaemias of Southern Indian Rubber Estate Labourers.** With a statistical analysis by D. R. WESTGARTH. *Med. J. Malaya.* 1952, Sept., v. 7, No. 1, 25–35, 4 figs.

Forty-one patients, all with haemoglobin levels below 6 gm. per cent., were investigated. Treatment consisted of rest in bed and full hospital diet. When there was evidence of malaria—for which, even in the absence of parasitaemia, splenic enlargement was taken as a sign—100 mgm. paludrine [proguanil] were given daily; this applied to 13 of them. Fourteen had hookworm infection and were treated with oil of chenopodium. From the examination of their blood and their bone marrow, the 41 patients were divided into the following 3 groups:—

Group 1. Three cases with megaloblastic erythropoiesis;

Group 2. Three cases with normoblastic erythropoiesis, but with clinical complications;

Group 3. Thirty-five cases with uncomplicated normoblastic erythropoiesis.

The last 35 were divided into 4 groups, according to the technique of iron treatment. Those in the first 3 groups received iron by mouth, 1·8 gm. per day; of these, the patients in the first group (9) were given iron only. Those in the second group (10) had additional calcium caseinate, 30 gm., and one

pint of milk daily. The third group (7) were given 150 mgm. of ascorbic acid per day in addition to the iron. The fourth group (9) were given intravenous iron, 50 mgm. initially, followed by 100 mgm. on alternate days. The 4 groups responded alike; there were some in each who recovered well and rapidly, and others who gave poor responses; but, nevertheless, on statistical examination, it was clear that there was no difference between the 4 treatments. They all had a normocytic or microcytic picture at the start of treatment and one-third of them developed macrocytosis by the end of the first month of treatment.

[As the post-treatment mean haemoglobin was between 9 and 10 gm. per cent., the authors' claim that they were *successfully* treated cannot be conceded as far as complete cure of the anaemia is considered, and the fact that in some macrocytosis, presumably due to reticulocytes and early post-reticulocytes, was present, suggests that there must have still been peripheral blood loss. This is particularly so, as the authors say that macrocytosis was more likely to appear when the response to treatment was slow. One wonders whether there were hookworms still present, or some other cause of peripheral blood destruction.]

The 3 cases with megaloblastic marrow were treated with folic acid, 30 mgm. per day. This resulted in an improvement, followed by a fall in the MCHC and MCV. Iron treatment was of no avail.

The group in which there was normoblastic erythropoiesis with clinical complications—dry pleurisy, scrub typhus, and an undiagnosed fever—did not respond to oral iron therapy. It was not possible to follow up one of these 3 cases, but the other 2 responded after the concurrent disease had been eliminated. *H. Lehmann*

Spies, T. D., Stone, R. E., Suarez, R. M., Garcia-Lopez, G., Lopez-Toca, R. & Reboredo, A. **Antianemic Properties of Reaction Products of Vitamin B_{12} and the Intrinsic Factor.** *J. Amer. Med. Ass.* 1953, Apr. 11, v. 151, No. 15, 1264–6, 1 fig.

Beef muscle contains a heat-stable substance which produces little or no response, when eaten by a patient with pernicious anaemia unless normal gastric juice or substances acting similarly are administered with it. This unknown substance in the gastric juice has no haemopoietic power when given alone, and it is termed "the intrinsic factor". It was thought, since the discovery of vitamin B_{12}, that the practical importance of this agent was not great. However, some of the authors of the present publication described in 1950 the response of patients with pernicious anaemia in relapse to a reaction product of vitamin B_{12} and the intrinsic factor [see this *Bulletin*, 1951, v. 48, 400], and they are now reporting on the continuation of this investigation.

They selected 8 patients with pernicious anaemia, one with nutritional macrocytic anaemia, and two with tropical sprue, and during a control period lasting from 10 to 30 days, each patient was given 10–15 μgm. of crystalline vitamin B_{12} [presumably each day] by mouth. During all this time the patients were given a meatless diet. No response was seen during this control period. They were then given tablets containing a potent intrinsic factor preparation as well as vitamin B_{12}, but in no instance was the amount of vitamin B_{12} administered more than the patient had received during the control period. In all cases haemopoietic as well as clinical responses occurred; they were, however, more marked in the patients with pernicious anaemia than in the 3 others.

In 3 other patients known to absorb vitamin B_{12} poorly by mouth, the response was not enhanced by the addition of the intrinsic factor, but a

significant improvement followed a single intramuscular injection of 10 μgm. of the vitamin. In a third study, the responses of 11 cases of pernicious anaemia in relapse and of 11 cases of tropical sprue in relapse were compared. When intrinsic factor concentrate was administered with 10 μgm. of vitamin B_{12} by mouth, definite though submaximal clinical and haemopoietic responses were seen in the cases of pernicious anaemia, but not in those suffering from tropical sprue.

The authors claim that their observations clearly demonstrate that the average patient with pernicious anaemia responds better than the average patient with tropical sprue to the administration of vitamin B_{12} and intrinsic factor concentrate, and that the day of practical oral therapy with vitamin B_{12} for the former is now at hand. *H. Lehmann*

LEHMANN, H. **The Sickle-Cell Trait: Not an Essentially Negroid Feature.** Reprinted from *Man.* 1953, v. 53, Art. 5. [20 refs.]

The author refers to RAPER's suggestion that the high incidence of sickle-cell anaemia in North American sicklaemics might be due to an admixture of non-Negro-blood [this *Bulletin*, 1950, v. 47, 655]. Lehmann points out that the strict homozygous theory has now been abandoned generally and refers to the recent literature on this point. His own finding, with CUTBUSH [this *Bulletin*, 1952, v. 49, 1152] of a high frequency of the sickle-cell trait in the Veddians of South India has altered the view that the gene is essentially African. The universal African blood feature is the Rhesus-gene combination Rh_0. This chromosome is rare in other populations, but a frequency of less than 50 per cent. has not yet been found south of the Sahara; the only exception is a high Rh_0 incidence in some Malayan Negritos.

On the other hand, the sickle-cell trait is only patchily distributed in Africa. The author quotes evidence of this and shows that the incidence falls towards the west and as one goes south. It is suggested that the trait entered the African continent with Veddian blood after the African races had already been established. Apart from South India, Veddians have been found in " pockets " in Persia and in the Hadhramaut [in the eastern part of the Aden Protectorate], which brings them to the former land bridge between Asia and Africa in the Aden region. Thus the trait seems to have entered from the north-east and has been spreading south and west.

Hence the sickle-cell trait—unlike the Rh_0 frequency—cannot be used as a " tracer " of African ancestry. Even the occasional carrier found in Italy and Greece can no longer be assumed to have inherited the gene from an African forebear. It is stated that anthropological evidence of Veddian characters has been found in Sardinians, among remains of predynastic Egypt and in skulls found in a cave in Monaco. Thus Veddian blood may have found its way into Mediterranean people. *H. J. O'D. Burke-Gaffney*

STIJNS, J. & DELVILLE, J. P. Étude comparative des méthodes de recherche " *in Vitro* " de la falciformation. [**Study Comparing in Vitro Methods for the Discovery of Sickling**] *Ann. Soc. Belge de Méd. Trop.* 1952, Oct. 31, v. 32, No. 5, 479–89. [11 refs.]

The authors fill an important gap in the work on sickle-cell trait incidence by examining the various methods in use for detecting it. They come to the conclusion that the following 4 methods are preferred to all others for reliability and ease of application.

Incubation with:

1. Isotonic sodium hydrosulphite;
2. Isotonic sodium metabisulphite;
3. Suspension of *Bact. coli*;
4. Suspension of bakers' yeast.

The last of these agents has not been used before and is newly introduced by the authors. *H. Lehmann*

FLOCH, H. La méniscocytémie en Guyane Française. Remarques cliniques. Essais thérapeutiques. [**Clinical and Therapeutic Observations on Sickle-Cell Anaemia in French Guiana**] *Méd. Trop.* Marseilles. 1952, Sept.–Oct., v. 12, No. 5, 522–31. [21 refs.]

The author describes 2 sickle-cell-trait carriers and 4 patients with sickle-cell anaemia whom he has seen in French Guiana. Three of the sickle-cell anaemia patients were first seen as infants, and one when she was 13 years old. The first was 6 months old and was still alive one year later, when she was treated with vitamin B_{12}. The second was 14 months old and died a few days after admission. The third was aged 9 months and was also treated with vitamin B_{12}. The fourth was 13 years old when first seen and was observed for over 7 years, and was still alive at the time this report was written. This patient, too, was treated with vitamin B_{12}. In the opinion of the author, vitamin B_{12} had some beneficial effect, although, of course, it did not cure the disease. *H. Lehmann*

ANSPAUGH, R. D., ROST, E. C. & CLEARY, J. W. **Pregnancy with Sickle Cell Anemia and Placenta Accreta.** *U.S. Armed Forces Med. J.* 1952, Aug., v. 3, No. 8, 1239–40.

DERMATOLOGY AND FUNGUS DISEASES

FONZARI, M. Ensaios terapêuticos no pênfigo foliáceo. [**Treatment of Pemphigus foliaceus**] *Arquivos de Dermat. e Sifiligrafia de São Paulo.* 1952, July–Dec., v. 14, Nos. 3/4, 10/34. [22 refs.] English summary.

The author has made trial of a large number of drugs in the treatment of pemphigus foliaceus; among them several quinoleine compounds, acridine compounds (rivanol and trypaflavine), and several sulphonamide drugs and sulphones, the common antibiotics, penicillin, aureomycin, terramycin, chloramphenicol, rutin, vitamin D_2, para-aminobenzoic acid, ACTH and cortisone. With some of these only 2 or 3 patients were treated, with others a score or more. The results are detailed for each of these; those interested should consult the original, but for the general reader the results may be summed up by saying that though on the whole tolerance was good—in a few patients untoward symptoms of gastric pain, nausea and vomiting necessitated withholding the drug for a time at least—the benefits obtained were slight; a drying up of secretion, improvement of exfoliation and desquamation, but in none was cure effected and in many the symptoms returned when the drug was stopped. *H. Harold Scott*

FONZARI, M. BCG no pênfigo foliáceo. Nota prévia. [**BCG in Pemphigus Foliaceus. Preliminary Note**] *Arquivos de Dermat. e Sifiligrafia de São Paulo.* 1952, July–Dec., v. 14, Nos. 3/4, 35/9.

The English summary appended to the paper is as follows:—

"BCG has been applied orally in two patients suffering from pemphigus frustus, 1 patient of pemphigus frustus in stage of generalization and 2 of pemphigus foliaceus in ways of remission through quinacrine. All cases presented an actual reaction of the lesions with tendency to decrease or disappear."

FINK, J. C., VANDERPLOEG, D. E. & MOURSUND, M. P. **"Stilbamidine" in the Treatment of Cutaneous Blastomycosis. Report of a Case.** *J. Amer. Med. Ass.* 1953, Apr. 18, v. 151, No. 16, 1395–7, 4 figs. [Refs. in footnotes.]

An American soldier, aged 41, while stationed in England, was subjected to a routine radiological examination of the chest, which showed "large feathery areas of increased density extending from the hilar regions into the lung bases". There were no related symptoms and serial X-ray examinations showed the gradual and complete resolution of the pulmonary infiltrate. A diagnosis of primary atypical pneumonia was made. Shortly before the time of the first X-ray examination, a nodule was noticed on the back of the man's neck, but its probable connexion with the pulmonary disorder was not appreciated and the lesion was not recorded. After 3 months, other nodules appeared on the cheeks, forehead, right hand, chest and right thigh. Some of these were typical of the cutaneous lesions of blastomycosis (*Blastomyces dermatitidis*) and the fungus was seen in exudates from them.

On the diagnosis of cutaneous blastomycosis, the patient was treated with potassium iodide and radiotherapy, and Whitfield's ointment was applied to the lesions. This treatment caused some improvement in the lesions but did not cure them. On the man's return to the United States, a few months later, the diagnosis of blastomycosis was confirmed and, as he showed a marked degree of dermal sensitivity to *Blastomyces* vaccine, he was given a desensitizing course of injections of that vaccine, followed by a course of superficial low-voltage X-ray therapy which, however, had an unfavourable effect on the lesions. Radiotherapy was therefore stopped and treatment with "stilbamidine" commenced, according to the method used by SCHOENBACH *et al.* [*Bulletin of Hygiene*, 1952, v. 27, 61, 1112].

In the present case, stilbamidine was administered, by slow intravenous drip, in 200 ml. of 5 per cent. glucose solution, commencing with a dose of 0·05 gm. daily for 3 days, then 0·1 gm. daily for 3 days, followed by 0·15 gm. daily for 9 days, the total dosage being 1·8 gm. No sign of toxic action appeared but the patient's clinical state showed improvement and the fungus could no longer be found in preparations from the lesions. A second course of stilbamidine in doses of 0·15 gm. daily for 13 days was commenced 44 days after the completion of the first course. During this second course, rapid and complete involution of the skin lesions took place and cure was apparently effected. The total dosage of the two courses was 3·75 gm. Throughout the treatment with stilbamidine the patient was kept on a diet low in protein and purine.

One month after completion of the treatment, the patient suffered an attack of trigeminal neuropathy which was still present at the time of submitting the report, 2 months later. Fifth nerve neuropathy is not an uncommon delayed toxic complication of stilbamidine treatment.

J. T. Duncan

MISCELLANEOUS DISEASES

JELLIFFE, D. B. **Antibiotic Treatment of Infective Gangrene of the Mouth.** *J. Trop. Med. & Hyg.* 1953, Mar., v. 56, No. 3, 53–6, 4 figs. [16 refs.]

The author describes the aetiological factors, course and treatment of 53 cases of cancrum oris treated in the children's wards of University College, Ibadan, Nigeria, between January, 1949, and May, 1951.

The most important predisposing factors were age, malnutrition and other infections. The children were between 2 and 5 years of age. All took a predominantly carbohydrate diet and were thin, showing clinical signs of vitamin B deficiency. There is an increase in the number of cases admitted during the "hungry months". Malaria and intestinal helminthiasis with iron-deficiency anaemia were common. The exciting cause appeared to be fuso-spirochaetal infection of the gums with an inflammatory reaction proceeding to infective gangrene of the mouth. The mortality is high in this disease. Treatment of these cases was by 150,000 units of procaine penicillin intramuscularly each day, continued usually until all dead tissue had separated, and associated with a high protein diet and vitamin supplements. Other infections were also treated. The mortality in these cases was about 30 per cent.

Early in 1952 trial was made on 6 unselected cases of cancrum oris with aureomycin (3 cases) and terramycin (3 cases) given orally in a dosage of 25 mgm. per kgm. per day in 3 divided doses, continued for an average of 4 weeks. The dietetic and other measures were as in the penicillin-treated cases. Bronchopneumonia and bone infection were successfully overcome, and only 1 of the 6 patients died.

The disadvantages of this therapy were the difficulty of persuading seriously ill children to swallow bitter-tasting medicine, and persistent diarrhoea during the treatment in all cases. The author suggests the theoretical possibility that such therapy may interfere with vitamin B absorption. He concludes that though oral treatment by aureomycin or terramycin is effective in infective gangrene of the mouth, parenteral penicillin is the drug of choice.

S. Bell

WILKINSON, J. **The History of Onyalai.** *East African Med. J.* 1953, Mar., v. 30, No. 3, 89–97. [42 refs.]

Dr. John Wilkinson of Kenya reviews onyalai from the time that it was first described in 1904 by WELLMAN (*J. Trop. Med. & Hyg.*, 1904, v. 7, 52) in the Benguela District of Angola. Since then at least 27 papers have been published on this interesting form of essential thrombocytopenia in which, in addition to purpuric manifestations in the skin and viscera, blood-blisters are characteristically found in the oral cavity. Wellman's contribution was followed by that of Yale MASSEY later the same year (*ibid.*, 269), also from

Angola. Three years later he also recorded the disease in an African in the Upper Congo (*ibid.*, 1907, v. 10, 116).

For some years after this, little seems to have been written on the subject, although in German East Africa (Tanganyika) FELDMANN (1905) and MENSE (1906) record an illness called *edjuo*, the description of which is not typical of onyalai. Nor does the disease, which Mense referred to as *kafindo*, appear to be allied to onyalai, and is now regarded as an acute pharyngitis or even cerebral malaria. In 1920, however, WELCH reported, for the first time from Kenya, a member of the Meru tribe presenting the picture of onyalai [this *Bulletin*, 1921, v. 17, 241].

After this period, interest in the disease seems to be confined to the two Rhodesias, Bechuanaland and the Transvaal, from which territories most of the cases seem to be recorded. It has that interesting geographical distribution in that it is prevalent in South Central Africa (excluding Nyasaland) and West Africa, yet for reasons unknown is uncommon elsewhere in Africa.

The exact cause of onyalai is not known, although GEAR, YEO and BODENSTEIN [this *Bulletin*, 1944, v. 41, 1067] suggest a toxic origin for the disease—either from some drug like arsenic or one contained in an African medicine supplied by the witch doctor. Others, again, have regarded it as a vitamin deficiency.

Excellent descriptions of the disease were given by GILKES of Northern Rhodesia in 1934 [this *Bulletin*, 1934, v. 31, 751] and by MORRIS of Southern Rhodesia in 1926. Morris suggested that intramuscular blood (20cc.) from any donor was effective, the bleeding ceasing soon after, and this therapy has been supported by other workers.

The most important publication on this subject is by BLACKIE of Southern Rhodesia [this *Bulletin*, 1938, v. 35, 74] who discovered that the bleeding was due to a thrombocytopenia. Whether onyalai is a disease peculiar to the African or not is not known as there have been one or two references to its occurrence in Europeans and members of other races. STEIN and MILLER [*ibid.*, 1944, v. 41, 970] recorded such a case in a European male and a Chinese female living on the Witwatersrand. [The reviewer has found an early reference to this disease in the Native Department records by H. M. JACKSON, a Native Commissioner working in Matabeleland, who reported this bleeding disease in his annual report in 1901.]

The article has a full list of references. *Michael Gelfand*

DESCHIENS, R. & MAUZÉ, J. Action de la cortisone dans l'éosinophilie tropicale. [**Action of Cortisone on Tropical Eosinophilia**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 7/8, 110–13.

The characteristic features of the syndrome known as tropical eosinophilia are: (1) leucocytosis with eosinophilia usually in excess of 30 per cent.; (2) an invasion period lasting a few weeks sometimes associated with pyrexia; (3) pulmonary signs of asthma or bronchitis; (4) lymphadenopathy; (5) asthenia with anaemia; (6) favourable response to trivalent or pentavalent arsenic.

Nine patients with tropical eosinophilia were treated with cortisone during 1952 at the Pasteur Institute, Guadeloupe. They were given a total of 500 to 1,000 mgm. per 60 kgm. of body weight over a period of 10 to 20 days. A dosage of 50 to 150 mgm. was given on alternate days. Compared with the initial count there was a fall of 30 per cent. to 76 per cent. in the proportion of eosinophiles, while the number of eosinophiles per cmm. of blood decreased by 35 per cent. to 90 per cent. of the original. In 7 out of 9

cases a reduction of 25 per cent. to 60 per cent. in the total leucocyte count was found, the leucocytes increasing by 20 per cent. and 50 per cent. respectively in the two remaining cases.

Two cases of eosinophilia resulting from parasitic infestation were used as controls. After treatment with cortisone the eosinophile count in one patient fell by 20 per cent. whereas the other rose by 3 per cent.

The authors conclude that the effect of cortisone in tropical eosinophilia lends some support to the hypothesis that the condition is essentially an allergic one. *H. T. H. Wilson*

DESCHIENS, R. Incidence de la cortisone sur l'eosinophilie tropicale. [**Action of Cortisone on Tropical Eosinophilia**] *Schweiz. med. Woch.* 1953, Apr. 18, v. 83, No. 16, 387–8.

This paper is substantially the same as that abstracted above.

HIGGINSON, J. **Study of Malignant Neoplastic Disease in Primitive Communities with special reference to South Africa.** *South African Med. J.* 1953, Apr. 25, v. 72, No. 17, 341–4. [12 refs.]

At a conference on Cancer Demography held at Oxford in 1950 [see *Bulletin of Hygiene*, 1953, v. 28, 428] the problem of cancer among primitive people received special attention. It was clear that relatively little information was available on the incidence of cancer in many primitive people, but that such statistics would be valuable in the study of the influence of environment on carcinogenesis. In such communities registration of cases is difficult and for practical purposes the hospitals provide the majority of cancer cases, but unfortunately it is not usually known how representative of the general population are the patients who attend hospital. In these communities laboratory facilities are frequently unsatisfactory, and lesions such as tuberculomata, liver abscess and amoebomata increase the difficulties of cancer diagnosis, so histological confirmation is essential. Where no census has been carried out sampling is the only method available for determining the numbers and composition of the population at risk. Many primitive people do not know their ages, which must then be determined by correlation with historical events.

Under such conditions a cancer survey should be designed so that (1) as few cases as possible escape notification, even if some are registered twice; (2) histological and autopsy confirmation would be done wherever possible; (3) address and period of urbanization of each patient must be determined; (4) cases from outside the area must be excluded; (5) attention should be confined to urban areas in the first instance; (6) the accuracy of available census figures should be confirmed by random sampling by native social workers.

The frequency of a specific cancer relative to all cancers is unduly influenced by age grouping, and by accuracy of diagnosis, especially as between accessible and inaccessible sites, which varies from hospital to hospital. The composition of the hospital population should be compared with that of the general population to see how representative it may be. These general principles are illustrated by the case of the Bantu in South Africa, for whom no figures at all are available. Here we have a relatively pure negroid race, formerly leading a pastoral life now becoming urbanized with loss of dietetic and tribal customs. Abnormalities in metabolism and hormone balance, which are rare in Europeans, are postulated to be frequent

in Africans [this *Bulletin*, 1950, v. 47, 85; 1952, v. 49, 1166] and are probably of environmental rather than of genetic origin.

At present at the South African Institute for Medical Research a cancer survey is being instituted, from which it is found that only 17 per cent. of those admitted to the non-European hospital were over 45 years of age, compared with 47 per cent. in the Johannesburg European General Hospital, among whom this age-group supplies 84 per cent. of total admissions for carcinoma. Every type of cancer can occur in the Bantu, the percentage in each age-group increasing with age, as in Europeans. Basal-cell carcinoma, in contrast to squamous-cell carcinoma, forms a small proportion of admissions for skin cancer. The ratio of gastric to oesophageal cancer is low, in comparison with European figures, to judge from which 15 times more gastric cancers should have been seen than were actually observed. Cancer of the liver forms one-third of all cancers involving the gastro-intestinal tract and 5 per cent. of all malignant tumours seen. Cancer of the cervix uteri forms nearly 50 per cent. of the total tumours, probably in association with early marriage and many pregnancies.

[See the Symposium referred to above, in which other observations are referred to.] *W. L. Harnett*

PROTOZOOLOGY: GENERAL

Havlík, O. Výskyt toxoplasmosy v Československu. [**The Occurrence of Toxoplasmosis in Czechoslovakia**] *Českoslov. Hyg., Epidemiol., Mikrobiol.* Prague. 1952, v. 1, Nos. 2/3, 148–53, 2 figs. on pl. [14 refs.]

Sera from persons or their relatives living in all parts of Czechoslovakia suffering from suspected toxoplasmosis were examined by the dye test of Sabin and Feldman in dilutions of 1:5, 1:20 and 1:100. In all 365 sera were examined; a titre of 100 or higher was found in 50 sera, a titre of 20 in 37, and of 5 in 17 sera. A study of the clinical findings showed that a titre of 20 was usually found in adult patients; a titre of 100 could be regarded as positive and a titre of 20 as probably positive. In 89 instances sera from mothers and their children were examined; both were positive in 15 instances, both negative in 55, the mother alone positive in 12, and the child alone in 7 instances which may have been acquired infections. The titre in the mother is thus the most important in the diagnosis of congenital toxoplasmosis, since the titre in the infant may be negative in the presence of undoubted infection. In 3 instances mothers of infants with congenital infection gave birth to normal children later. *D. J. Bauer*

Borzone, R. A. & Lapieza Cabral, P. Primera observación Argentina de Toxoplasmosis humana. [**First Record of Toxoplasmosis in Man in Argentina**] *Semana Méd.* 1953, Apr. 9, v. 102, No. 15, 489, 2 figs.

Otto, H. Gedanken zur Epidemiologie, Therapie und Prophylaxe der menschlichen Toxoplasmose. [**Observations on the Epidemiology, Therapy and Prophylaxis of Human Toxoplasmosis**] *Ztschr. f. ärztl. Fortbildung.* 1953, Mar. 1, v. 47, No. 5, 164–72, 2 figs. [89 refs.]

Toxoplasmosis has been known to exist in man for 30–40 years. It was discovered for the first time in England by Jacoby and Sagorin in 1946 [this

Bulletin, 1949, v. 46, 401]. In 1937, the first laboratory test was described. It is assumed that 1·5 per cent. of mankind suffers from the disease, and in Germany it is believed that one million people are infected.

The author gives an account of the organism, its appearance and distribution in the body and the organs commonly attacked.

Although the infection can be transmitted through the placenta, the organism has not yet been found in the uterus and amniotic fluid. There are two types of infection: the intra-uterine, and the one which might be acquired by eating raw, or not properly cooked, hare, rabbit, chicken or pigeon. It is important in this connexion to note that the organism can survive up to 14 days at 4°C.

On the whole, exogenous infection seems to lead to a latent carrier state, and only the intra-uterine transmission from a carrier mother has disastrous consequences in the foetus. An interesting point is that, in a case of twins, 1 child was seen to be healthy, whereas the other suffered from toxoplasmosis.

Various drugs which were found to be useful in the treatment of tropical infections have not been of great help in the treatment of toxoplasmosis. Some authors secured success with aureomycin and chloramphenicol; others used sulphonamide drugs and penicillin. *H. Lehmann*

Lock, J. A. **Cultivation of** *Toxoplasma gondii* **in Tissue Culture in Mammalian Cells.** *Lancet.* 1953, Feb. 14, 324–5, 1 fig.

The cultivation of *Toxoplasma gondii* may help to elucidate the gaps in our knowledge of the life-cycle and bionomics of this parasite, as well as provide the means of carrying out chemotherapeutic tests under conditions similar to those found *in vivo*. However, up to the present the parasite has been cultivated only in avian tissue, which could not be expected to provide information of the same value as cultures in mammalian tissue. In the present paper the author describes for the first time a promising method for growing *Toxoplasma* in such a medium.

Explants of embryonic rat heart were grown on coverslips in 10 per cent. each of rat serum and embryonic extract in Tyrode's solution. Three or four days later the tissue was inoculated with a few drops of peritoneal exudate from an infected mouse. An alternative method was to expose the explants to the parasites in the exudate before starting the tissue culture.

In these cultures the host cells (fibroblasts, macrophages and muscle cells) were invaded by the parasites, which rapidly multiplied in them. In some cultures growth was observed up to 10 days.

A photomicrograph shows the appearance of the parasites in tissue culture. *C. A. Hoare*

Vermeil, C. & Maurin, J. Toxoplasmose expérimentale et chorio-méningite lymphocytaire chez la souris. [**Experimental Toxoplasmosis and Lymphocytic Choriomeningitis in a Mouse**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, Nos. 1/2, 5–13.

The following is a translation of the authors' summary:—

In attempting to preserve a strain of *Toxoplasma* in the cold, we isolated a virus from the material used for the passage of the protozoal strain. This virus, when inoculated into the brain of mice, caused the appearance of a disease clinically suggesting lymphocytic choriomeningitis [LCM]. The histology of the cerebral lesions and cross-neutralization tests with a known

strain of LCM confirmed this. The developing toxoplasmosis had masked the manifestations of the LCM. We purified the strain of *Toxoplasma* with a serum which neutralized the virus. This unsuspected association might prove important in connexion with the preparation of *Toxoplasma* antigens.

H. J. O'D. Burke-Gaffney

MONTESTRUC, E. Le parasitisme intestinal aux Antilles et à la Guyane française. [**Intestinal Parasitism in the Antilles and in French Guiana**] *Arch. Inst. Pasteur de la Martinique.* 1953, Jan.–Apr., v. 6, Nos. 1/2, 3–18, 1 fig. [12 refs.]

A general account, with some information on the protozoa and worms found in a series of examinations of faeces.

DESCHIENS, R. & POIRIER, M. L'immunité dans les infestations parasitaires. [**Immunity in Parasitic Infections**] *Ann. Inst. Pasteur.* 1952, Dec., v. 83, No. 6, 725–44.

This paper gives a useful short account of the different types of immunity which are of importance in parasitology. It is pointed out that premunition is only a special form of ordinary immunity and as a rule is heterologous. There is (1) natural immunity—complete, as in the reaction of man to *Plasmodium berghei*, or relative, as in man to *P. knowlesi*; (2) acquired immunity—complete, as in *P. relictum* in canaries, relative, as in human schistosomiasis, or localized as in skin immunity to certain ticks; and (3) a temporary provoked immunity after inoculation of the living organism (in piroplasmosis) or the dead (*P. lophurae*). The physical basis of immunity is summarized under the headings (*a*) cellular, (*b*) humoral and (*c*) auxiliary (*e.g.*, the effect of fever, inflammation, hormones, malnutrition). Finally, serological reactions are enumerated in regard to specific parasites, and the technique of the complement-fixation test and intradermal reactions as practised at the Pasteur Institute is described in detail. The following antigens are available from the Institute for the complement-fixation test:—*Fasciola*, schistosome, hydatid, filaria, *Trichinella*, *Ascaris*; the following for the intradermal:—*Fasciola*, schistosome, hydatid, filaria, *Trichinella*, *Ascaris* and *Entamoeba*.

P. C. C. Garnham

JÍROVEC, O. *Pneumocystis carinii*, původce t. zv. interstitiálních plasmocelulárních pneumonií kojenců. [*Pneumocystis carinii*, **the Cause of so-called Interstitial Plasma-Cell Pneumonia**] *Českoslov. Hyg., Epidemiol., Mikrobiol.* Prague. 1952, v. 1, Nos. 2/3, 141–8, 1 text fig. & 4 figs. on pl. German summary.

Since the description of 16 cases of interstitial plasma cell pneumonia of infants in Czechoslovakia caused by *Pneumocystis carinii*, more than 100 cases have been recognized from many parts of the country, and in the present paper a summary of the clinical and pathological aspects of the condition is given. The diagnosis can only be made at autopsy by the examination of smears or impressions of pieces of lung stained with Giemsa and the recognition of sporogonia or other developmental stages of the parasites; attempts to make a diagnosis from the examination of laryngeal or tracheal swabs have not been successful. The alveoli are filled with foam-like material which represents an aggregation of the mucoid envelopes of the parasites; the appearances are illustrated in photomicrographs.

The organism is well known as a parasite of domesticated and wild animals in a number of countries (mice, rats, dogs and guineapigs are mentioned), but the author has so far been unsuccessful in attempts to demonstrate its presence in animals in Czechoslovakia. Infection takes place through inhalation of spores, or from contaminated food. The cases observed by the author were all in premature or undernourished infants between the ages of 2 to 6 months. Most cases were fatal; 2 recovered spontaneously and 12 responded to chemotherapy. The characteristic features of the disease are tachypnoea, cyanosis and absence of response to antibiotics. The disease responds to antiprotozoal agents (stovarsol, mepacrine, emetine, quinine, plasmoquine), which should be given immediately in any cases of infantile pneumonia which fail to respond to antibiotic treatment. *D. J. Bauer*

See also p. 710, McCowen, Callendar, Lawlis & Brandt, **The Effects of Erythromycin (Ilotycin, Lilly) against certain Parasitic Organisms.**

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Evans, J. W. **The Injurious Insects of the British Commonwealth (except the British Isles, India and Pakistan) with a Section on the Control of Weeds by Insects.**

This book was reviewed on p. 589.

DeCoursey, J. D. & Webster, A. P. **Effect of Insecticides and other Substances on Oviposition by** *Aëdes sollicitans*. *J. Econom. Entom.* 1952, Dec., v. 45, No. 6, 1030–4, 2 figs.

It has been observed that ammonia is attractive to the females of certain insects and is effective in promoting oviposition. Strong ammonia is lethal to female mosquitoes, but they will still lay their eggs before death occurs and this phenomenon of death with oviposition is termed a death stress. In the experiments described here, death with oviposition occurs after exposure to insecticides, and forced-laying, under unfavourable conditions, is suggested as an additional reason for the efficiency of insecticides in the control of certain species.

About 1,000 *Aëdes sollicitans* were collected from an area untreated with insecticides and were maintained in an insectary under standard conditions. After 7 days' captivity, separate groups of them were treated with certain irritants including ammonia and also with 6 different insecticides. Ten females were exposed to an irritant, the exposure varying according to the time required to produce a death stress. After exposure each insect was transferred to a separate container and maintained at a constant temperature. The numbers of eggs obtained under wet and therefore

favourable conditions were compared with those obtained under dry unfavourable conditions.

The mean number of eggs per female was determined 24 hours after exposure to the chemical agents, and for these substances statistical analysis showed no significant difference between the figures obtained.

In the first series various concentrations of insecticides were used in the powdered state with talc as the diluent and in the second series various concentrations of DDT were used. Ten mosquitoes at a time were exposed in insecticide-coated flasks for 60 seconds.

The following results were obtained:—

Percentage insecticide		*Mean No. of eggs/female* 1. *Wet conditions (favourable)*	2. *Dry conditions (unfavourable)*
Aldrin ..	0·25	14	15
Chlordane ..	2·0	47	42
DDT	5·0	53	89
Rotenone ..	2·5	69	57
Toxaphene ..	0·25	71	7
BHC	0·2	84	99
Talc control		89	0

In the first case the low numbers for aldrin and chlordane are suggested to be due to the concentrations used; in the dry conditions all but aldrin and toxaphene produced figures significantly higher than the control at the 1 per cent. level of probability.

The effects of various concentrations of one insecticide are shown by using from 0·5 per cent. to 5·0 per cent. DDT. The mean number of eggs per female in concentrations of 2 per cent. and 5 per cent. were less than in the control at the 5 per cent. level of probability.

Mechanical stress, that is damage to the mosquito's head, was observed to cause oviposition to start immediately and numbers of eggs comparable to those obtained with other agents were obtained. *Anne Hudson*

Mathis, W. & Quarterman, K. D. **Field Investigations on the Use of Heavy Dosages of Several Chlorinated Hydrocarbons as Mosquito Larvicides.** *Amer. J. Trop. Med. & Hyg.* 1953, Mar., v. 2, No. 2, 318–24.

The paper describes field trials of DDT, BHC, etc., against mosquitoes breeding in small lakes and ponds near Savannah, Georgia, between 1948 and 1951. The ponds ranged from 0·1 to 2 acres in area, were sheltered from winds and mostly consisted of still, stagnant water. The mosquitoes found as larvae included *Uranotaenia sapphirina*, 3 species of *Culex*, 2 of *Aëdes*, a *Psorophora* and *Anopheles crucians*.

The insecticides were applied as water emulsions by ordinary hand-spraying equipment. Heavy doses were used to obtain prolonged control. In some cases ("pre-flood treatments") the dry sites of ponds were sprayed early in the season, just before their flooding by rains in June. The results were assessed by regular weekly dipping inspections. No attempt was made to assess larval populations, but control was considered to have ceased

when large larvae began to appear in the weekly inspections and more and larger immature larvae were observed. "In effect, the degree of control obtained was approximately 100 per cent. . . ." during this period.

The results showed dieldrin to be the most effective compound tested. At 1 lb. per acre it gave control for two seasons (60–80 weeks). Even at 0·25 lb. per acre, control lasted 8 to 12 weeks. DDT at 3 lb. per acre gave control for 13 to 23 weeks. Its effectiveness was not enhanced by the addition of rosin. BHC (12 per cent. *gamma*) at 1 lb. per acre gave control for 3 to 8 weeks. Toxaphene at 1 to 3 lb. per acre persisted only for 4 to 6 weeks.

These results were for the trials on standing water, but analogous results were obtained in the pre-flooding trials. However, in 6 trials of DDT and BHC on ponds fed with flowing water from an artesian well, the period of effectiveness of the treatments was greatly reduced (3 to 6 weeks by 3 lb. DDT and 1 to 2 weeks by 1 lb. BHC).

Observations were made on the effect of the treatments on fish and other wild life. All the treatments except BHC were destructive of fish and other aquatic life at the doses stated. However, 5 treatments per year of technical BHC were made for 3 consecutive years without appreciable effect on the fish of two large ponds. *J. R. Busvine*

MITCHENER, A. V. **Control of Mosquitoes with DDT, Aldrin, Dieldrin, Endrin and Isodrin.** *J. Econom. Entom.* 1953, Feb., v. 46, No. 1, 164.

"(1) Aldrin, dieldrin, endrin and isodrin were more toxic to the larvae presumably of *Aëdes dorsalis* (Mg.) than DDT when used at the rate of 1 p.p.m. of actual toxicant in water.

"(2) Endrin especially, and to a lesser extent, dieldrin, isodrin and aldrin were toxic to mosquito pupae at the rate of 1 p.p.m. in water on the same species of mosquito, while DDT was relatively ineffective."

AMERICAN MOSQUITO CONTROL ASS. BULL. No. 2. 1952, Mar. 98 pp., 30 figs. [Numerous refs.] **Ground Equipment and Insecticides for Mosquito Control.**

A remarkable variety of machines and gadgets have been invented for applying insecticides, but the most original and spectacular are not always the most efficient. An administrative medical authority or sanitary official in charge of a mosquito control programme may well be puzzled to choose the best equipment for the operations required. This booklet is intended to summarize the principles involved and to describe the main types of equipment which can be used in different situations.

Some notes on the methods of mosquito control are followed by a brief historical review of the development of insecticides and spraying equipment. Then follows a section on the physical characteristics of spray particles of different sizes; these are explained simply and various terms such as aerosol, smoke and fog are defined by particle size. Another section describes the methods employed to atomize liquids by different types of nozzle, etc. Following this are a few pages devoted to the principal insecticides used in mosquito control, giving the main formulations employed and the rates of

application. Considerable space is then allotted to a series of short descriptions of a variety of different types of equipment. This part is illustrated by photographs of commercial models, almost exclusively of American make. Information is given on the selection and use of equipment for particular aspects of mosquito control and advice is summarized in tabular form.

A section describing methods of evaluating the results of treatment is then followed by precautionary advice on the dangers of careless use of insecticides and some notes on public relations in connexion with control programmes. Finally there is a bibliography and a series of appendices giving specifications and similar data.

This is clearly a useful handbook, though tropical hygiene authorities in the British Commonwealth would probably find even more useful a similar publication from Britain. *J. R. Busvine*

American Mosquito Control Ass. Bull. No. 1. 1948, Mar., 46 pp., 45 figs. on 22 pls. [68 refs.] **The Use of Aircraft in the Control of Mosquitoes.**

A considerable number of investigations of aircraft spraying for mosquito control have been published since this booklet appeared; several have been noted in this Bulletin [*e.g.*, 1950, v. 47, 672; 1951, v. 48, 297, 678; 1952, v. 49, 451; 1953, v. 50, 254].

Nevertheless, there are many useful basic data in this publication and there appears to be no more recent comprehensive summary of the subject. The types of aircraft suitable are only indicated; but detailed descriptions would presumably be of American models, and therefore not of universal interest. The various types of equipment are briefly described and include straight discharge pipes, spray nozzles, rotating disks and brushes, and the use of exhaust gases to produce aerosols.

The types of DDT formulation and the effective doses recommended have not been modified by more recent trials. The information on droplet size is likewise reliable, as far as it goes. There are not enough data of deposits and results obtained in actual trials, and rather too many vague statements like the following: "Swath [*sic*] widths vary between 30 and 300 feet and altitudes of flight are usually 10 to 150 feet." Nevertheless, this booklet is a useful foundation with which to begin a study of aircraft spraying against mosquitoes.

There are 34 photographic illustrations, 12 line drawings of equipment. The latter are reproduced on too small a scale to be really useful.

J. R. Busvine

Huttel, W., Huttel, Nancy & Verdier, P. A propos de deux *Culicoïdes* nouveaux du Gabon (Diptera Heleidae). [**Two New** *Culicoides* **from Gabon**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, Nos. 1/2, 98–107, 2 figs. [50 refs.]

Four species of *Culicoides* were recently found in Gabon, French Equatorial Africa. Two were particularly abundant and are here described as new species, *C. jouberti*, and *C. tristanii*; the wings of the new species are illustrated. Both of them attacked man in camp and in the forest in the mornings and in the evenings.

The other two species were rare in the collection, they were *C. pseudopulicaris* (1 female) and *C. austeni* (2 females); these feed in the huts especially at night.

A brief review is given of the medical importance of insects of this genus. From personal experience one of the authors is convinced that *Culicoides* species are vectors of " red fever " of the Congo. *H. S. Leeson*

JOBLING, B. **On the Blood-Sucking Midge** *Culicoides vexans* **Stager, including the Description of its Eggs and the First-Stage Larva.** *Parasitology.* 1953, May, v. 43, Nos. 1/2, 148–59, 4 figs. [24 refs.]

FREDEEN, F. J. H., ARNASON, A. P. & BERCK, B. **Adsorption of DDT on Suspended Solids in River Water and its Role in Black-Fly Control.** [Correspondence.] *Nature.* 1953, Apr. 18, v. 171, 700–701.

Black-fly larvae have been practically eliminated from streams and rivers in Saskatchewan by the application of DDT at a rate of 0·1 p.p.m., as a 10 per cent. solution, the effective distance normally being up to 9 miles. However, similar application of DDT to the Saskatchewan River for 16 minutes gave effective control of *Simulium arcticum* for 98 miles. This river has a high rate of discharge and turbid water during certain seasons of the year, and is free from aquatic vegetation. During the test the suspended solids ranged as high as 550 p.p.m. and from a point 68 miles down-stream from the point of application the suspended clay and fine silt contained 0·24–0·26 μgm. of DDT/gm. Laboratory experiments showed that these solids would adsorb DDT from 0·1 p.p.m. suspension of DDT in distilled water.

It was observed that the larvae of *S. arcticum* consume suspended particles in river water including much inorganic material and that the treatment produced very much greater mortality of black-fly larvae than of other aquatic insects that normally do not feed on small suspended particles.

Thus DDT associated with suspended solids gives outstanding results in black-fly control, and the results suggest that other turbid fast-flowing rivers might be treated similarly, and the addition of finely divided inorganic material with marked DDT adsorptive properties along with the larvicide to clear water streams and rivers would be advantageous.

Thomas E. Fletcher

MITRA, R. D. & MITRA, S. D. **A Discussion on the Subgeneric Position of** *Phlebotomus* **(Diptera: Psychodidae).** *Ztschr. f. Parasitenk.* 1953, v. 15, No. 6, 433–6, 3 figs. [11 refs.]

DICKE, R. J., MOORE, G. D. & HILSENHOFF, W. L. **House Fly Response to Volatilized Chlorinated Hydrocarbon Insecticides.** [Erratum.] *J. Econom. Entom.* 1953, Feb., v. 46, No. 1, 184.

This is a table which was omitted from the paper with the above title which was abstracted in this *Bulletin*, 1953, v. 50, 258. It shows in detail the effects on house-flies of each of the volatilized insecticides discussed.

LEWIS, D. J. **The Tabanidae of the Anglo-Egyptian Sudan.** *Bull. Entom. Res.* 1953, Apr., v. 44, Pt. 1, 175–216, 28 figs. [Numerous refs.]

The present paper is based on the author's own collecting in nearly every part of the Anglo-Egyptian Sudan and on published records, including allusions in travellers' books.

The first part of the paper deals with the 70 Tabanidae of the Sudan, listing localities and showing the distribution within the country on a series of maps. It is unfortunate that the maps intended to show the position of places mentioned in the text have been reproduced in such a way that all names are illegible, except those of Provinces. The author then passes to consider the zoogeography as illustrated by these and certain other biting insects, and to discuss the composition of the fauna and the types of habitat characteristic of particular Tabanidae within the Sudan.

On the applied side of the subject the author states that in the extreme south-west, where the small tributaries of the Nile run down through savannah woodland, Tabanidae cause little annoyance, partly because this is tsetse country so that there are few cattle. The real Tabanid problem, so far as cattle are concerned, is in the flat plain of seasonal swamps, much of it generally known as the Sudd. On the whole, Tabanidae extend northwards as a serious nuisance so far as the clay soil of the plain goes; they become much less common where clay is replaced by sand. The boundary corresponds approximately to the 500 mm. isohyet. Within the area of abundance the insects are on the wing in the rains roughly from July to September; they cause a serious problem to the cattle owner. There is strong evidence from the field that they transmit *Trypanosoma congolense*, and also *T. vivax* to a lesser extent, in an area from which it seems that *Glossina* is completely absent. These epidemics of nagana have occurred very widely in an area of some 100,000 square miles, killing about one and a half million cattle. In the dry season 1946–1947 the deaths at one time exceeded 10,000 per month. In addition, in the country lying still further to the north, there is a disease of camels known as *gufar* in Arabic, caused by *Trypanosoma evansi*. There is little doubt that it is carried by Tabanidae.

Coming to a matter of direct medical importance, the distribution of *Loa* infection in man in a small area along the frontier in the south-west of the Sudan is briefly discussed. The people mostly affected are the Zande, agricultural folk without cattle, and transmission through species of *Chrysops* has been demonstrated in this area.

The author concludes an extremely interesting paper by a brief account of the movement of pastoral tribes and of the migrations of domestic animals with their owners. *P. A. Buxton*

Rivosecchi, L. Contributo alla conoscenza delle Stomoxydinae italiane (Diptera, Muscidae). [**Observations on Stomoxydinae in Italy**] *Riv. di Parassit.* Rome. 1953, Jan., v. 14, No. 1, 29–36, 18 figs. [15 refs.] English summary (6 lines).

Sacca, G. & Rivosecchi, L. Contributo alla conoscenza faunistica del genere *Sarcophaga* in Italia (Diptera, Calliphoridae). [**Observations on the Genus *Sarcophaga* in Italy**] *Riv. di Parassit.* Rome. 1953, Jan., v. 14, No. 1, 37–47. [16 refs.] English summary (3 lines).

Nikolić, Nikola. Ophtalmooestriasis externa (conjunctivitis parasitaria), profesionalna bolest ovčara. [**Conjunctivitis due to *Oestrus ovis*, an Occupational Disease of Shepherds**] *Arhiv Hig. Rada.* Zagreb. 1952, v. 3, No. 3, 315–18, 2 figs. on pl. French summary.

In 1950 an inhabitant of a village in south-west Yugoslavia complained of pain in the eyes and a sensation of something moving in the conjunctival sac and causing intense irritation. The trouble was greatest in the daytime

and subsided somewhat at night. On examination there was blepharospasm, profuse lachrymation, oedema of the lids, and chemosis. With the aid of a lens an object ½ mm. long could be seen moving actively in the conjunctival sac. It was removed and examined under the microscope and was identified as a larva of the sheep blow-fly (*Oestrus ovis*); 10 larvae were found in all. Four other patients were seen later with the same condition; all lived in close proximity to herds of sheep. The cases occurred in September and October, and may have been brought about by a sudden decrease in numbers of the sheep caused by an epizootic, which induced the adult insect to attack man as an alternative host. Treatment with 3 per cent. boric acid solution and sulphonamides was rapidly effective. [See also this *Bulletin*, 1953, v. 50, 259.] *D. J. Bauer*

JADIN, J. & VERCAMMEN-GRANDJEAN, P. H. Les trombiculides larvaires du Ruanda-Urundi. [**Larval Trombiculidae in Ruanda-Urundi**] *Ann. Soc. Belge de Méd. Trop.* 1952, Dec. 31, v. 32, No. 6, 593–656, 19 pls. (1 folding). [16 refs.]

In tropical Africa, trombiculid mites have not attracted attention by being a pest or in virtue of apparent association with disease in man. Few records exist even of their occurrence. Recent claims [this *Bulletin*, 1951, v. 48, 727] suggesting the existence of infections of *Rickettsia orientalis* in indigenous people of Ruanda-Urundi in the Belgian Congo stimulated the present authors to make a survey for trombiculid larvae on small mammals. Of 766 animals examined in the period January to May, 1952, 27·3 per cent. were positive for trombiculid larvae, these being found characteristically on the ears. The material obtained comprised 13 new species of trombiculid: *Trombicula panieri, T. bruynoghei, T. boaedonia, Eutrombicula rodhaini, E. jadini, Schöngastiella dureni, S. lavoipierrei, Ascoschöngastia andrei, A. causicola, Gahrliepia lawrencei, Gateria philipi; Giroudia longiscutullata and G. brennani* are not only new species, but the new genus *Giroudia* is created to contain them. Detailed descriptions of all these new species and the characters for the new genus are given, accompanied by numerous well-drawn figures. Types have been deposited with the Belgian Congo Museum at Terriren, and in some cases also at the Rocky Mountain Laboratory, Hamilton, Montana. There is no mention of any known species in the material.

It must be concluded that this group of arthropods is not rare in central Africa but has been overlooked in the past, since the range of hosts consists of the insectivore *Crocidura* sp., and 13 species of rodent of the genera *Claviglis, Thamnomys, Oenomys, Dasymys, Arvicanthis, Pelomys, Lemniscomys, Mastomys, Leggada, Cricetomys, Otomys, Lophuromys* and *Dendromus*. No mites were found on *Rattus rattus alexandrinus, Tachyoryctes*, or *Tatera* (up to 22 individuals examined) nor on the bats *Epomophorus* and *Nyctinomus*. *Dasymus bentleyae*, which is to some extent associated with man, was host to all the trombiculid species except *S. lavoipierrei*. About 33 per cent. of 376 individuals examined were infested; over 1,000 *T. panieri*, 325 *A. andrei* and 725 *G. longiscutullata* were taken from this host. Some of the other rodents harboured several species of mite, as many as about a third of them being infested.

By inoculation of mice, guineapigs and rabbits with *T. panieri, A. andrei* and *S. lavoipierrei*, a rickettsia of the boutonneuse group was obtained, apparently similar to one isolated from man at Musha (Astrida) in the Belgian Congo. Negative results were obtained with *G. longiscutullata*.

D. S. Bertram

HEISCH, R. B. & GUGGISBERG, C. A. W. **On *Ornithodoros zumpti* n.sp., a New Tick from South Africa.** *Parasitology*. 1953, May, v. 43, Nos. 1/2, 136–8, 10 figs.

HEISCH, R. B. & HARVEY, A. E. C. **The Biology of *Ornithodoros graingeri* Heisch & Guggisberg, 1952.** *Parasitology*. 1953, May, v. 43, Nos. 1–2, 131–2.

HEISCH, R. B. **On a Spirochaete isolated from *Ornithodoros graingeri*.** *Ibid.*, 133/5.

FULTON, R. A. & GELARDO, R. P. **A Method for determining Water in Insecticidal Aerosols.** *Soap*. New York. 1953, Feb., v. 29, No. 2, 145–7, 159–61, 3 figs.

Owing to the fact that in insecticidal aerosols with petroleum solvents, moisture over 60–70 p.p.m. exists as free water at the liquid level of the aerosol solution and in the vapour above the liquid, corrosion always takes place at or above the liquid level. For corrosion by water to be eliminated the moisture content must be less than 80 p.p.m. and thus an accurate method of water estimation is necessary.

This paper gives a detailed procedure for estimation of water in insecticidal aerosols in finished containers and is a development of that by REED and DOWNING (*Chemical Specialties Manufact. Assoc. Proc.*, 1951, Dec., 41–44) in which the water present was titrated with Karl Fischer reagent. Owing to evaporation of free moisture during the titration in the original method the authors extract the water with ethylene glycol and then electrometrically titrate the removed water in the glycol layer with Karl Fischer reagent. Details are given of the apparatus and reagents needed, the preparation and standardization of the Karl Fischer reagent, and of the analysis procedure, together with a number of precautions to be taken to obtain reproducible results. By this method it was found that 95 per cent. of the water in a container can be determined when the water content ranges from 15 to 150 p.p.m. Two extractions with ethylene glycol are necessary to obtain similar accuracy with a higher water content.

Thomas E. Fletcher

SOAP. New York. 1953 (Blue Book). 26th edition, 211–22. **U. S. Government Specifications. General Requirements of U.S. Federal Specifications for Soaps, Cleaners, Detergents, Polishes, Insecticides, etc.**

BOOK REVIEWS

RODENWALDT, Ernst. [Edited by.] **Welt-Seuchen-Atlas.** [World-Atlas of Epidemic Diseases] Part I. pp. 12+I/125+52 folding pp. of coloured maps & numerous text figs. 1952. Hamburg: Falk-Verlag, Burchardstrasse 8. [In German & English.] [£20 10s.]

The understanding of epidemiology demands perspective, an appreciation of the variations of disease in form, frequency and distribution. Within our own time there has been the dramatic mutation of a strain of smallpox from the classical type to alastrim, the emergence and disappearance of encephalitis lethargica, the increasing prevalence of poliomyelitis and minor

changes in many diseases to remind us that the opportunity of transmission is not the sole variable which determines the incidence of disease. Looking further afield there is the great difference in the spectrum of disease as seen by Sydenham and ourselves, the Sweating Sickness which devastated London in the 15th century and could not be identified with any known condition until it was recently identified as a local disease in the Rhone valley, the occurrence of pandemics of plague separated by centuries of apparently total disappearance, the emergence of cholera last century as a disease of world importance, and a host of other happenings which remind us that the picture of disease is ever-changing, for reasons which we do not yet understand and in a way we cannot predict. Recent work begins to probe some of them, as in the mutation of the antigenic property of the influenza virus and the strictly focal nature of truly endemic plague and cholera, but they leave the general field almost unexplored. The nearest approach to understanding lies in geographical and historical study.

For 70 years a single book, Hirsch's *Handbook of Historical and Geographical Pathology*, has remained the classic account of variation in disease, and the essential background to all studies of it. It is a vast review of literature covering all the important epidemic diseases, many centuries and all continents. Its author described distribution and variation in incidence in much detail and documented his account with innumerable references to literature in which fuller information could be sought; in consequence his work has been accepted for all these years as an unsurpassable review and as an essential starting point for further studies.

Much has happened since 1883, the date of the English translation of Hirsch, but, curiously, it is often more difficult to trace in the literature than that which happened before. The authors of the present work start out on this basis; they acknowledge Hirsch and the need to carry his work onward in time; they modify his technique of presentation, giving an account of each disease in German and English by an author whose special study it has been, illustrated by copious maps on which such things as distribution in time and space are indicated. The intention is to prepare a series which shall be as compendious in content as was Hirsch's book and of which this is the first volume.

The present production is much concerned with Europe, though not exclusively. It includes maps and accounts of typhoid, paratyphoid C, cholera between 1863 and 1868, bacterial and amoebic dysentery (the latter in Europe and the Mediterranean area, tularaemia, leprosy (in Europe), relapsing fever, leptospirosis, poliomyelitis, infective hepatitis, trachoma, louse-borne typhus, leishmaniasis and its vectors in the Mediterranean basin, opisthorchiasis and ascariasis, together with maps and information on rainfall, temperature and population. Some information on world distribution is given in maps of typhoid, paratyphoid C, cholera and leptospirosis. The single volume constitutes a massive work demanding long study to appreciate it, and illustrated by 40 large (24″ × 18″) multicoloured maps and 12 basic maps, and all of it is excellently produced.

The inevitable first comparison is with the utility of Hirsch. The accounts, all by different authors, naturally vary both in method of handling and scope; moreover the German and English versions differ, the latter being deliberately concentrated so that the reader without German is deprived of some of the fullness of the text. As an extreme example only, the account of paratyphoid C is thus condensed to one-sixth of its original size, though its essence is retained. There is also great variation in the bibliographical standard; leprosy, dysentery, leishmaniasis and trachoma are

treated liberally in this respect and the student is given an excellent springboard from which to go far into the subject. Accounts of other diseases are less freely documented; most have reasonable support with the notable exception of typhoid, for which 6 key references only are given.

A similar variation appears in the text. The story of leishmaniasis, for instance, is detailed and satisfying and with its bibliography constitutes an admirable authoritative review; the account of typhus is longer and fuller, contains much valuable matter, but being largely presented as a series of conclusions with points to illustrate them, and these fully documented, has the style of an authoritative lecture to the advanced student more than of material for the original worker.

The chief interest in presentation is in the maps, which it is pointed out, are largely experimental in presentation. On the whole they make it possible to understand the distribution and movement of disease far more readily than could any text. After this their value depends on the accuracy with which the spatial distribution can in fact be delineated. In some cases, for example, cholera, this is reasonably precise; in others, such as infective hepatitis, wide inferences must be drawn from limited facts and it is easy to give false ideas of accuracy by cartographical representation, but the possible pitfalls have been foreseen and the Editor is to be congratulated on the way in which he has avoided them, producing a series of which most are excellent and all informative provided their limitations are understood.

The general standard is high; the method of presentation makes the work readily and quickly comprehensible as it could not be in text alone and was not in Hirsch, and has thereby enhanced its value for many practical purposes though the decreased documentation has lessened it for the research worker. The atlas is not a continuation of the classic but a new presentation which for its text and maps will become essential to students of geographical pathology. *G. Macdonald*

EICHLER, Wolfdietrich. **Behandlungstechnik parasitärer Insekten.** [Methods of treating Parasitic Insects] pp. xv+286, 82 figs. 1952. Leipzig: Geest & Portig. [DM. 19.60.]

The author has compiled an extensive collection of methods for use in the field and the laboratory in collecting, rearing and mounting biting or parasitic insects. His own wide experience with several of the groups has made it possible for him to include a considerable number of practical hints. The work contains about 80 line drawings and figures of insect breeding places. There is a list of some 230 references, many of them recent, and an index which appears to be full.

The value of a book of this type can only be proved by using it. It is certainly comprehensive and planned in such a way as to make reference easy. Some of the sections are so short that it may be doubted whether they are valuable: for instance, a single page on methods of catching wild rodents is surely inadequate. *P. A. Buxton*

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